EIC 2800
SEARCH REPORT

STIC Database Tracking Number: 316187

To: BROOKE PURINTON
Location: JEF-3B15
Art Unit: 2881
Friday, December 04, 2009

Case Serial Number: 10/599555

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Search Notes

Attached are the edited search results and the search histories from searching EAST databases and CAS/STN Chemical Abstracts.

The search histories are included at the end of this file.

I recommend that you review at least Page 2 to about Page 20 of this file.

After the first 20 pages: The second half of this file has some abstracts about the existence and properties of the isomers explicitly mentioned in the claims.

An apparently comprehensive list of isomers and their half lives is at the "Nuclear Physics A" journal article at this URL: http://amdc.in2p3.fr/nubase/Nubase2003.pdf
I've included some data excerpts in the search results.

If you would like more searching on this case, or if you have questions or comments, please notify me.

DERWENT-ACC-NO: 1994-250295

TITLE: Vasculer implant **containing two or more radionuclides with specific half lives** for long lasting prevention of restinosis or short lived isotope disintegrating to long lived daughter

INVENTOR: FEHSENFELD P; HEHRLEIN C

PRIORITY-DATA: 1993DE-4315002 (May 6, 1993)

PATENT-FAMILY:

PUB-NO	**PUB-DATE**	**LANGUAGE**
DE 4315002 C1	**August 18, 1994**	**DE**
WO 9426205 A1	**November 24, 1994**	**DE**
EP 696906 A1	**February 21, 1996**	**DE**
JP 08508436 W	**September 10, 1996**	**JA**
EP 696906 B1	**April 16, 1997**	**DE**
US 5674177 A	**October 7, 1997**	**EN**
JP 2735689 B2	**April 2, 1998**	**JA**

ABSTRACTED-PUB-NO: DE 4315002 C1

Vascular implant for inhibiting and/or eliminating vascular constrictions contains at least two radionuclides, one with half life 7 hrs. to 7 days, the other with half life over 100 days.

Alternatively, the implant contains a single isotope of half life 7 hrs. to 7 days that disintegrates directly or indirectly to a daughter nuclide of half life over 100 days.

Pref. nuclides are esp. gamma emitters, esp. for short half lives Co 55, Mn 52, Tc 96, Mo 99 and Ni 57 and for long half lives Fe 55, Zn 65 or Co 57.

USE/ADVANTAGE - These implants (stents) are used to prevent restenosis. The entire region where there is a risk of restenosis is irradiated for the entire period that the stent is in place. Initially, the radiation dose is fairly high, subsequently it is moderate but relatively long lasing. The radionuclides can be generated in the implant after this has been made, i.e. they are not applied as a coating which might become detached.

US 5674177 Abstract Text - ABTX (1):

In a vascular implant for the prevention or elimination of vascular restrictions a tubular body to be inserted into a body vessel **includes at least a first nuclide species which has a half life in the range of 7 hours to 7 days and a second nuclide species which has a half life of more than 100 days.** Instead of providing a second nuclide species, the first nuclide species may also decay into the second nuclide species thereby providing a high initial radioactivity for a relatively short period and a relatively low radioactivity over a relatively long period.

DERWENT-ACC-NO: 1997-153036

TITLE: Marking and identification of articles comprises use of **radioactive isotopes with different half-life periods, applied in determined ratio** to article

INVENTOR: LYAPIDEVSKII V K
PRIORITY-DATA: 1993RU-026033 (May 20, 1993)

PATENT-FAMILY:

PUB-NO	**PUB-DATE**	**LANGUAGE**
RU 2064697 C1	**July 27, 1996**	**RU**

An identifying marker is applied to an article being marked and contains radioactive substances. The radioactivities of the substances are registered and are used for the identification of the article. **A mixture of radioactive isotopes with different half-life periods is used and their ratios in the identifying marker are varied**, so that the number of decays of each isotope is from 100-1000000 decays per sec.. The summed amplitude distribution is measured and acts as a code of the article at the moment of its registration. The code and the date of registration are fixed in a long-term memory and are used to identify the article at any moment of time taking into account **the change of the amplitude distribution because of partial decay of the radioactive isotopes** in the identifying marker.

USE - Used for the marking and identifying of articles.

ADVANTAGE - The process gives a reduced complexity of application of radioactive substances.

(57) Abstract:
FIELD: radiation monitoring. SUBSTANCE: object is marked with an identification sign containing radioactive substances, and its radioactivity is measured and is used for recognizing of the object. Mixtures of isotopes with different half-life periods are used. The object is identified according to the pulse-height distribution with due account made for partial decay of radioactive isotopes. EFFECT: facilitated procedure.

From RU 2064697 C1, Page 3:

2. Способ по п. 1, отличающийся тем, что опознавательный знак наносят на объект в виде слоя эпоксидной смолы, содержащей радиоактивные изотопы Na^{22}, Co^{60}, Nb^{96}, Sb^{125}, Cs^{134}, Cs^{137}, Bi^{207}, их смеси и соединения.

US-PAT-NO: **5782742**
DOCUMENT-IDENTIFIER: **US 5782742 A**
See image for Certificate of Correction
TITLE: Radiation delivery balloon
DATE-ISSUED: **July 21, 1998**

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Detailed Description Text - DETX (34):

The activity of the material that is produced is a function of the new isotope's half-life and irradiation time. The activity A, produced is determined by the formula . . . .

Detailed Description Text - DETX (35):

in which e is the base of the Naperian or natural logarithm (i.e., 2.718 . . .), and the elapsed time is t. .lambda. designates the decay constant of the isotope that is formed, and is calculated as the Naperian logarithm of two divided by the half life of the isotope. (It is important that time is measured in the same units in all of these calculations.) It should be noted that after a given time, a saturation point is reached, and no further activity is produced by neutron bombardment, i.e., the material is decaying away as fast as it is being produced. This represents an upper limit for the specific activity of a given isotope that can be produced under these conditions.

Detailed Description Text - DETX (52):

As an alternative to P-32, other radionuclides such as Yttrium-90 (Half-life=64.0 hours; Maximum Beta Energy=2.27 Mev; Average Beta Energy=0.9314 MeV; Betas Per Nuclear Disintegration=1.00; Maximum Range in Tissue=1.11 cm); Gold-198 (Half-life=2.696 Days; Maximum Beta Energy=961 keV; Average Beta Energy=316.3 keV; Betas Per Nuclear Disintegration=1.00; Maximum Range in Tissue 0.42 cm); and Iridium-192 (Half-life=74.2 Days; Maximum Beta Energy = 666 kev; Average Beta Energy=222 keV; Maximum Range in Tissue=0.25 cm) may also be useful.

US 5782742 Claim:

23. A radiation delivery balloon catheter as in claim 21, wherein the radiation delivery source is selected from the group consisting of Pt, P-32, Y-90, Au-198, Ir-192, Mo-99, and combinations thereof.

FYI: data at http://amdc.in2p3.fr/nubase/Nubase2003.pdf

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Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life			J^π	Ens	Reference	Decay modes and intensities (%)
^{192}Ir	−34833.2	1.7			73.827	d	0.013	4^+	98		β^-=95.13 14; ε=4.87 14
^{192}Ir^m	−34776.5	1.7	56.720	0.005	1.45	m	0.05	1^-	98		IT≈100; β^-=0.0175
^{192}Ir^n	−34665.1	1.7	168.14	0.12	241	y	9	(11^-)	98		IT=100
^{198}Au	−29582.1	0.6			2.69517	d	0.00021	2^-	02		β^-=100
^{198}Au^m	−29269.9	0.6	312.2200	0.0020	124	ns	4	5^+	02		IT=100
^{99}Mo	−85965.8	1.9			65.94	h	0.01	$1/2^+$	95		β^-=100
^{99}Mo^m	−85868.0	1.9	97.785	0.003	15.5	μs	0.2	$5/2^+$	95		IT=100

US-PAT-NO: **5855546**

DOCUMENT-IDENTIFIER: **US 5855546 A**
TITLE: Perfusion balloon and radioactive wire delivery system
DATE-ISSUED: **January 5, 1999**
INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hastings; Roger N.	Maple Grove	MN	N/A	N/A
Urick; Michael J.	Rogers	MN	N/A	N/A

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Detailed Description Text - DETX (52):

As previously stated, a preferred source of radiation for all embodiments of the present invention is the radioactive compound Nickel-66. **Nickel-66 decays with a half life of 2.28 days with only low energy beta emissions** and no gamma emission **into its daughter element Copper-66. Copper-66 then emits high energy beta radiation with a half life of 5.10 minutes** and decays into the stabile element Zinc-66. This **two-step decay** has a particular advantage in use in the catheters of the present invention.

Detailed Description Text - DETX (53):

The Nickel-66 acts as a carrier for the high energy copper decay allowing for time to transport the source to the end user, and also allows for disposal of the device through ordinary means in about 23 days. **A Copper-66 source alone would decay quickly and not be useful without the parent Nickel.** Nickel is low cost and has desirable mechanical properties in its pure form and in alloys, such as a Nickel Titanium alloy.

Detailed Description Text - DETX (55):

Another preferred radiation source is Gadolinium-153. **Gadolinium-153 is a composite gamma source** **which can provide low energy gammas** to vessel intima layer while providing higher energy gammas to penetrate calcified plaques and reach the adventitia. . . .

FYI: data at http://amdc.in2p3.fr/nubase/Nubase2003.pdf

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Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life			J^π	Ens	Reference	Decay modes and intensities (%)
^{66}Ni	−66006.3	1.4			54.6	h	0.4	0^+	98		β^-=100
^{66}Cu	−66258.3	0.7			5.120	m	0.014	1^+	98		β^-=100

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Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life			J^π	Ens	Reference	Decay modes and intensities (%)
^{153}Gd	−72889.8	2.5			240.4	d	1.0	$3/2^-$	98		ε=100
^{153}Gd^m	−72794.6	2.5	95.1737	0.0012	3.5	μs	0.4	$(9/2^+)$	98		IT=100
^{153}Gd^n	−72718.6	2.5	171.189	0.005	76.0	μs	1.4	$(11/2^-)$	98		IT=100

US-PAT-NO: **5873811**
DOCUMENT-IDENTIFIER: **US 5873811 A**
TITLE: **Composition containing a radioactive component for treatment of vessel wall**
DATE-ISSUED: **February 23, 1999**

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wang; Lixiao	Maple Grove	MN	N/A	N/A
Hastings; Roger N.	Maple Grove	MN	N/A	N/A

CLAIMS:

What is claimed:

1. A method for inhibiting restenosis at a vessel wall region comprising the steps:

providing an adhesive including a radioactive material; and

applying said adhesive to said vessel wall region.

2. A method as recited in claim 1 wherein said radioactive material is admixed with said adhesive.

3. A method as recited in claim 1 wherein said radioactive material is chemically bonded to said adhesive.

4. A method as recited in claim 1 wherein said radioactive material is selected from the group consisting of: **Phosphorus 32, Yttrium 90, Iodine 125, Iridium 192,** **and mixtures thereof**.

[Note, US 6422989 has wording similar to that in US 6019718.]

US-PAT-NO: **6019718**
DOCUMENT-IDENTIFIER: **US 6019718 A**
TITLE: Apparatus for intravascular radioactive treatment
DATE-ISSUED: **February 1, 2000**

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hektner; Thomas R.	Medina	MN	N/A	N/A

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Detailed Description Text - DETX (28):

As previously stated, a preferred source of radiation for all embodiments of the present invention is the radioactive compound Nickel-66. **Nickel-66 decays with a half life of 2.28 days with only low energy beta emissions and no gamma emission into its daughter element Copper-66. Copper-66 then emits** high energy beta radiation with a half life of 5.10 minutes and decays into the stabile element Zinc-66. This **two-step decay** has a particular advantage in use in the catheters of the present invention.

Detailed Description Text - DETX (29):

The Nickel-66 acts as a carrier for the high energy copper decay allowing for time to transport the source to the end user, and also allows for disposal of the device through ordinary means in about 23 days. **A Copper-66 source alone would decay quickly and not be useful without the parent Nickel.** Nickel is low cost and has desirable mechanical properties in its pure form and in alloys, such as a Nickel Titanium alloy.

US-PAT-NO: 6045495
DOCUMENT-IDENTIFIER: US 6045495 A
TITLE: Apparatus and method to treat a disease process in a luminal structure
DATE-ISSUED: April 4, 2000

The radiation source may be a pellet, a wire, an encapsulated radiation source, or an attached radiation source, such as a paste of Ir-192, I-125, or Pd-103. Alternatively, the radiation source may be a γ-radiation emitting isotope, such as, for example, one of the following: ^{109}Cd, ^{113}Sn, ^{125}Te, ^{125}I, ^{93}MO, ^{133} Ba, ^{145}Sm, ^{147}Eu, ^{146}Gd, ^{157}Tb, ^{254}Es, ^{242}Am, ^{169}Yb, ^{186}Re, ^{173}Lu, ^{172}Hf, ^{177}Lu, ^{179}Hf, ^{183}Re, ^{44}Tl, ^{178}Hf, ^{57}Co, ^{178}Hf, ^{57}Co, ^{101}Rh, ^{75}Se, ^{123}Te, ^{139}Ce, 166Ho, 235U, ^{101}Rh, ^{168}Tm, ^{176}Lu, ^{127}Xe, ^{95}Te, ^{177}Lu, ^{121}Te, ^{210}Bi, ^{182}Hf, ^{203}Hg, ^{176}Lu, ^{192}Ir, ^{194}Ir ^{150}Eu, ^{175}Hf, ^{249}Cf, ^{88}Zr, ^{75}Se, ^{210}Bi, ^{182}Hf, ^{203}Hg, ^{176}Lu, ^{178}Hf, ^{95}Te, ^{121}Te, ^{203}Hg, ^{192}Ir ^{178}Hf, ^{150}Eu, ^{249}Cf, ^{88}Zr.

FYI: data at http://amdc.in2p3.fr/nubase/Nubase2003.pdf

G. Audi et al. / Nuclear Physics A 729 (2003) 3–128 97

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life			J^π	Ens	Reference		Decay modes and intensities (%)
^{178}Hf	−52444.3	2.1			STABLE			0^+	94			IS=27.28 7
^{178}Hf^m	−51296.9	2.1	1147.423	0.005	4.0	s	0.2	8^-	94			IT=100
^{178}Hf^n	−49998.6	2.1	2445.69	0.11	31	y	1	16^+	94	94Ki.A	E	IT=100
^{178}Hf^p	−49870.8	2.2	2573.5	0.5	68	μs	2	(14^-)	94			IT=100

US-PAT-NO: **6187037**
DOCUMENT-IDENTIFIER: **US 6187037 B1**

TITLE: Metal stent containing radioactivatable isotope and method of making same

DATE-ISSUED: **February 13, 2001**

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Satz; Stanley	Surfside	FL	33154	N/A

ABSTRACT:

A metal stent for vascular implantation comprising a generally tubular structure whose external surface is adapted to engage the interior vascular surface when implanted, said metal of said stent containing a substantially uniform dispersion of from about 0.05 to about 10.00 percent by weight of one or more naturally occurring or enriched stable isotopes having a half-life of less than two months and that are principally beta particle emitters, so that when activated, said stent emits low to moderate dosages of radiation uniformly to reduce cell proliferation.

US 6187037 Claims Text - CLTX (10):

10. The stent as described in claim 1 wherein said radio-activatable isotope results in a radioactive isotope selected from the group consisting of antimony-120, antimony-127, barium-128, barium-131, barium-140, bromine-80m, cadmium-115, cerium-134, cerium-141, cerium-143, cobalt-55, copper-64, copper-67, dysprosium-166, erbium-172, gallium-166, gallium-68, germanium-71, gold-198, gold-199, iodine-124, iodine-125, iodine-131, iridium-194, lanthanum-140, lutetium-172, neodymium-140, nickel-66, niobium-95, osmium-191, palladium-100, phosphorus-32, phosphorus-33, platinum-188, platinum-191, platinum-193m, **platinum-195m**, platinum-197, praseodymium-143, rhenium-186, rhenium-188, rhodium-99, rhodium-101m, rhodium 103m, rhodium-105, rubidium-82, ruthenium-103, scandium-48, silver-111, strontium-82, tantalum-177, tantalum-183, tellurium-132, tellurium-118, terbium-153, terbium-156, thallium-201, thallium-204, thulium-170, thulium-172, **tin-117m**, tin-121, titanium-45, tungsten-178, ytterbium-166, ytterbium-169, yttrium-87, yttrium-90, yttrium-91, zinc-72, zirconium-89, **and mixtures thereof**.

[Note, US 6652441 has wording similar to that in US 6217503.]

US-PAT-NO: 6217503
DOCUMENT-IDENTIFIER: US 6217503 B1
TITLE: Apparatus and method to treat a disease process in a luminal structure
DATE-ISSUED: April 17, 2001

From US 6217503 Column 10:

The radiation source may be a pellet, a wire, an encapsulated radiation source, or an attached radiation source, such as a paste of Ir-192, I-125, or Pd-103. Alternatively, the radiation source may be a γ-radiation emitting isotope, such as, for example, one of the following: ^{109}Cd, ^{123}Sn, ^{125}Te, ^{125}I, ^{93}Mo, ^{133}Ba, ^{145}Sm, ^{147}Eu, ^{146}Gd, ^{157}Tb, ^{254}Es, ^{242}Am, ^{169}Yb, ^{186}Re, ^{173}Lu, ^{172}Hf, ^{177}Lu, ^{179}Hf, ^{183}Re, ^{44}Tl, ^{178}Hf, ^{57}Co, ^{178}Hf, ^{57}Co, ^{101}Rh, ^{75}Se, ^{123}Te, ^{139}Ce, ^{166}Ho, ^{235}U, ^{101}Rh, ^{168}Tm, ^{176}Lu, ^{127}Xe, ^{95}Te, ^{177}Lu, ^{121}Te, ^{210}Bi, ^{182}Hf, ^{203}Hg, ^{176}Lu, ^{192}Ir, ^{194}Ir, ^{150}Eu, ^{175}Hf, ^{249}Cf, ^{88}Zr, ^{75}Se, ^{210}Bi, ^{182}Hf, ^{203}Hg, ^{176}Lu, ^{178}Hf, ^{95}Te, ^{121}Te, ^{203}Hg, ^{192}Ir, ^{178}Hf, ^{150}Eu, ^{249}Cf, ^{88}Zr.

From US 6217503 Column 17:

The radioisotopes that decay with emission of beta plus or beta minus radiation, that have a half-life of between approximately 1 and 72 hours, that have an average decay energy of approximately 500–2000 keV, and that have radiation intensity of greater than or equal to approximately 50%, said radiation intensity being measured in % per decay, may be selected from the group consisting of NA-24, SI-31, K-42, SC-43, SC-44, CO-55, MN-56, CU-61, NI-65, GA-66, GA-68, ZN-71, GA-72, AS-72, SE-73, BR-75, AS-76, BR-76, GE-77, KR-77, AS-78, Y-85, KR-87, ZR-87, NB-89, Y-90, NB-90, SR-91, Y-92, Y-93, ZR-97, IN-111, AG-112, AG-113, SB-122, SN-127, TE-129, BA-139, LA-140, LA-141, LA-142, PR-142, PR-145, TB-148, PM-150, EU-152, HO-166, RE-188, RE-190, IR-194, BI-212, and radioactive sodium-chloride.

From US 6217503 Column 34, Line 48:

Further, isotopes that decay to those listed in the application may be used.

See also US 6217503 Tables 1-4.

FYI: data at http://amdc.in2p3.fr/nubase/Nubase2003.pdf

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Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life			J^π	Ens	Reference	Decay modes and intensities (%)
^{178}Hf	−52444.3	2.1			STABLE			0^+	94		IS=27.28 7
^{178}Hf^m	−51296.9	2.1	1147.423	0.005	4.0	s	0.2	8^-	94		IT=100
^{178}Hf^n	−49998.6	2.1	2445.69	0.11	31	y	1	16^+	94	94Ki.A E	IT=100
^{178}Hf^p	−49870.8	2.2	2573.5	0.5	68	μs	2	(14^-)	94		IT=100

[Note, US 6287249, US 6458069, and US 6491619 have wording similar to that in US 6261320.]

US-PAT-NO: 6261320
DOCUMENT-IDENTIFIER: US 6261320 B1
See image for Certificate of Correction

TITLE: Radioactive vascular liner
DATE-ISSUED: **July 17, 2001**

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Tam; Lisa A.	Lake Forest	CA	N/A	N/A
Trauthen; Brett A.	Newport Beach	CA	N/A	N/A

From Column 27, Line 12:

One preferred embodiment of radioactive-coated stent of the present invention is that which has an isotope layer comprising the gamma-emitting isotope ^{125}I.

Detailed Description Text - DETX (128):

Yet another preferred embodiment of radioactive coating of the present invention is that which has an isotope layer comprising tungsten-188 (W-188 or .sup.188 W) Tungsten-188 undergoes beta decay to become rhenium-188 (Re-188 or .sup.188 Re). Rhenium-188 undergoes beta decay as well, but emits a much higher energy particle than in W-188 decay. **The W-188 has a much longer half-life than does Re-188, thus the W-188 almost continuously creates more Re-188.** This process is known as "generator," and the generator isotopes are referred to together by the shorthand W/Re-188 to indicate the relationship between the species. **Generators are attractive for use in radiation delivery devices because they combine the energy levels of a short half-life species with the durability of the long half-life species.** It is a general rule that particle energy and half-life are inversely proportional, and that long half-life species are more economical and practical to work with than short half-life species.

Detailed Description Text - DETX (132):

Combinations of various isotopes provide another preferred embodiment in that, **for example**, **beta-emitting isotopes may be combined with gamma-emitting isotopes** where gamma isotopes can deliver dosage to greater depths.

US-PAT-NO: **6416457**
DOCUMENT-IDENTIFIER: **US 6416457 B1**
TITLE: System and method for intravascular ionizing tandem radiation therapy
DATE-ISSUED: **July 9, 2002**
INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Urick; Michael J.	Rogers	MN	N/A	N/A
Verin; Vitali E.	Geneva	N/A	N/A	CH
Popowski; Youri G.	Geneva	N/A	N/A	CH

Detailed Description Text - DETX (6):
Refer now to FIG. 3 which illustrates the radiation source wire 16 utilized in the system 10 illustrated in FIG. 1. Elongate source wire 16 includes two primary components, namely an elongate shaft 30 and a distally disposed radioactive source 32. Radioactive source 32 may approximate a line source as illustrated. **The radiation source 32 includes a radioisotope emitting ionizing radiation such as beta or gamma radiation.** Preferably, the radioactive source 32 comprises a radiation emitting isotope **such as Sr/Y-90**, P-32, Y-90, **Ce/Pr-144**, **Ru/Rh-106**, **W/Re-188**, Ir-192, I-125, or Pd-103. Radiopaque markers 34 and 36 may be disposed on either side of the radioactive source 32 to facilitate intravascular placement utilizing x-ray fluoroscopy. Elongate source wire 16 may comprise a wide variety of different designs incorporating an elongate shaft 30 and a distally disposed radioactive source 32. Preferably, the source wire 16 comprises the design disclosed in U.S. Pat. No. 5,728,042 to Schwager, which is hereby incorporated by reference.

US-PAT-NO: 6685618
DOCUMENT-IDENTIFIER: **US 6685618 B2**
TITLE: Method for delivering radiation to an intraluminal site in the body
DATE-ISSUED: **February 3, 2004**
INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Tam; Lisa A.	Lake Forest	CA	N/A	N/A
Trauthen; Brett A.	Newport Beach	CA	N/A	N/A Detailed

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Description Text - DETX (62):
Yet another preferred embodiment of thin film source of the present invention is that which has an isotope layer comprising tungsten-188 (W-188 or .sup.188 W). Tungsten-188 undergoes beta decay to become rhenium-188 (Re-188 or .sup.188 Re). Rhenium-188 undergoes beta decay as well, but emits a much higher energy particle than in W-188 decay. The W-188 has a much longer half-life than does Re-188, thus the W-188 almost continuously creates more Re-188. This process is known as "generator," and these generator isotopes are referred to together by the shorthand W/Re-188 to indicate the relationship between the species. Generators are attractive for use in radiation delivery devices because **they combine the energy levels of a short half-life species with the durability of the long half-life species**. It is a general rule that particle energy and half-life are inversely proportional, and that long half-life species are more economical and practical to work with than short half-life species.

US 6685618 Claims 15 and 16:

14. A method of treating a site within a vessel as in claim 11, wherein said isotope is a gamma or beta emitting isotope.

15. A method as in claim 11, wherein the radioactive isotope comprises an isotope selected from the group consisting of P-32, I-125, Pd-103, W/Re-188, As-73, and Gd-153.

FYI: data at http://amdc.in2p3.fr/nubase/Nubase2003.pdf

G. Audi et al. / Nuclear Physics A 729 (2003) 3–128

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life			J^π	Ens	Reference	Decay modes and intensities (%)
^{153}Gd	−72889.8	2.5			240.4	d	1.0	$3/2^-$	98		ε=100
^{153}Gd^m	−72794.6	2.5	95.1737	0.0012	3.5	μs	0.4	$(9/2^+)$	98		IT=100
^{153}Gd^n	−72718.6	2.5	171.189	0.005	76.0	μs	1.4	$(11/2^-)$	98		IT=100
...											
^{103}Pd	−87479.1	2.9			16.991	d	0.019	$5/2^+$	01		ε=100
^{103}Pd^m	−86694.3	2.9	784.79	0.10	25	ns	2	$11/2^-$	01		IT=100
^{188}W	−38667	3			69.78	d	0.05	0^+	02		β^-=100
^{188}Re	−39016.1	1.4			17.0040	h	0.0022	1^-	02		β^-=100

PGPUB-DOCUMENT-NUMBER: 20070272862 DOCUMENT-IDENTIFIER: US 20070272862 A1
TITLE: Method and Device for Remotely Communicating Using Photoluminescence or Thermoluminescence
PUBLICATION-DATE: November 29, 2007
INVENTOR-INFORMATION: **Desbrandes, Robert; Van Gent, Daniel Lee**
APPL-NO: 11/569357
DATE FILED: May 23, 2005

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FR	0405717	2004FR-0405717	May 26, 2004
FR	0503659	2005FR-0503659	April 12, 2005

PCT-DATA:
APPL-NO: PCT/EP05/52348
DATE-FILED: May 23, 2005
371-DATE: Nov 18, 2006

Brief Summary Text - BSTX (33):
[0047] Each group of entangled photons is made up of emitted photons together or at very short intervals by the same particle of the source, for example: electron, nucleus, atom, molecule.
The **sources of ad hoc entangled photons** usable for this invention **are, for example**:
[0048] **Natural or artificial radioactive materials producing a radiation in a cascade**.
For example, the Cobalt 60 atom emits almost simultaneously two gamma which are entangled and which can be used to irradiate a photoluminescent or thermoluminescent material. . . .

FYI: data at http://amdc.in2p3.fr/nubase/Nubase2003.pdf

G. Audi et al. / Nuclear Physics A 729 (2003) 3–128

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life			J^π	Ens	Reference	Decay modes and intensities (%)
^{60}Co	−61649.0	0.6			5.2713	y	0.0008	5+	00		β^-=100
^{60}Co^m	−61590.4	0.6	58.59	0.01	10.467	m	0.006	2+	00		IT≈100; β^-=0.24 3

FYI "Production of Cobalt-60", HW-64073, W.L. Bunch, Hanford Atomic Products Operation, 2-29-1960, Page 2
http://www.osti.gov/bridge/servlets/purl/10152247-upHZQJ/native/10152247.pdf

Cobalt-60 is produced from cobalt-59 in isomeric states. The short half-life (10.4 minutes) isomer decays primarily by gamma emission to the long half-life (5.28 year) isomer which subsequently beta decays to an excited state of nickel 60. Photons of energy 1.17 and 1.33 Mev are emitted to stabilize the nickel 60 nucleus. For long irradiations the existence of the short half-life isomer can be neglected and the differential equation describing the formation of cobalt-60 is:

$$\frac{dN_{60}}{dt} = \phi \sigma_{59} N^{0}_{59}\, e^{-\phi \sigma_{59} t} - \phi \sigma_{60} N_{60} - \lambda_{60} N_{60}$$

where N = number of atoms of cobalt (the subscripts refer to the isotopes),

ϕ = conventional neutron flux, n/cm^2 sec,

σ = absorption cross section for 2200 m/sec neutrons,

λ = decay constant (= $0.693/\tau$) in sec^{-1},

t = exposure time in sec,

and the superscript refers to the original number of atoms present.

VOLUME 82, NUMBER 4 PHYSICAL REVIEW LETTERS 25 JANUARY 1999

Accelerated Emission of Gamma Rays from the 31-yr Isomer of ^{178}Hf Induced by X-Ray Irradiation

C. B. Collins, F. Davanloo, M. C. Iosif, R. Dussart,* and J. M. Hicks
Center for Quantum Electronics, University of Texas at Dallas, Richardson, Texas 75083

From Page 697:

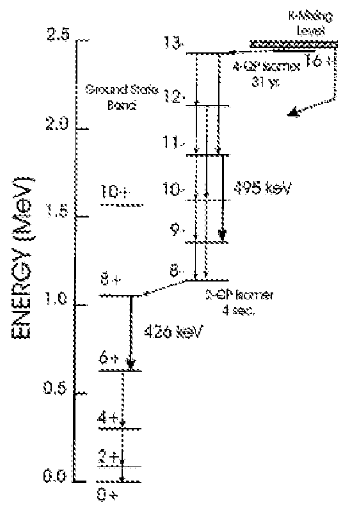

FIG. 3. Energy level diagram for ^{178}Hf showing a selection of levels relevant to this experiment. The spontaneous decay of the 31-yr, 16^+ isomer is shown by the thin arrows. The thick solid arrows show components studied in this work from the particular cascade from the decay forced by the x-ray irradiation. Heavy dotted arrows are inferred transitions needed to feed those shown.

During the spontaneous decay of the ^{178}Hf isomer the latter, being a member of the GSB, is fed only by cascade from the 4 sec, 8^- bandhead.

FYI: data at http://amdc.in2p3.fr/nubase/Nubase2003.pdf

G. Audi et al. / Nuclear Physics A 729 (2003) 3–128 97

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life			J^π	Ens	Reference		Decay modes and intensities (%)
^{178}Hf	−52444.3	2.1			STABLE			0^+	94			IS=27.28 7
^{178}Hf^m	−51296.9	2.1	1147.423	0.005	4.0	s	0.2	8^-	94			IT=100
^{178}Hf^n	−49998.6	2.1	2445.69	0.11	31	y	1	16^+	94	94Ki.A	E	IT=100
^{178}Hf^p	−49870.8	2.2	2573.5	0.5	68	μs	2	(14^-)	94			IT=100

L128 ANSWER 6 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1997:616665 HCAPLUS
DN 127:337716
OREF 127:66223a,66226a
ED Entered STN: 27 Sep 1997
TI **Half-lives** of isomeric levels of 87mSr, **111mCd**, **113mIn** and 115mIn activated by 60Co γ-ray irradiation
SO Nuclear Instruments & Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors, and Associated Equipment (**1997**), 397(2,3), 478-482
CODEN: NIMAER; ISSN: 0168-9002
PB Elsevier
Journal Contents:
http://www.sciencedirect.com/science?_ob=PublicationURL&_tockey=%23TOC%235314%231997%23996029997%2310802%23FLP%23&_cdi=5314&_pubType=J&_auth=y&_acct=C000055109&_version=1&_urlVersion=0&_userid=2502287&md5=ec893abac7bdb1577659de47a9e3985c

AB **Isomers having half-lives of a few hours were photoactivated by 60Co γ-ray irradiation** The **.gamma** .-rays emitted from the title isomers were measured with a low-background Ge detector. The **decay** data were analyzed by both a least-squares method and maximum likelihood method and the suitability of the latter method is discussed. The obtained **half-lives** are: 87mSr 2.811 ± 0.027 h, **111mCd** 48.30 ± 0.15 min, 113mIn 1.663 ± 0.011 h and **115mIn** 4.483 ± 0.005 h.

IT **Gamma** ray
(irradiation; **half-lives** of isomeric levels of 87mSr, 111mCd, 113mIn and 115mIn activated by 60Co γ-ray irradiation)
IT Nuclear energy level
(isomer; **half-lives** of isomeric levels of 87mSr, 111mCd, 113mIn and 115mIn activated by 60Co γ-ray irradiation)
IT **14191-71-0**, Indium 115, properties **14336-64-2**, Cadmium 111, properties
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(**half-lives** of isomeric levels of 87mSr, 111mCd, 113mIn and 115mIn activated by **60Co** γ-ray irradiation)
RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

RN 14336-64-2 HCAPLUS
CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

L128 ANSWER 15 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1987:109090 HCAPLUS

DN 106:109090

OREF 106:17751a,17754a

ED Entered STN: 05 Apr 1987

TI **Half-lives** of cadmium-111m, indium-113m, and indium-115m

AU Nemeth, Z.; Lakosi, L.; Pavlicsek, I.; Veres, A.

CS Inst. Isot., Hung. Acad. Sci., Budapest, H-1525, Hung.

SO Applied Radiation and Isotopes (**1987**), 38(1), 63-4
CODEN: ARISEF; ISSN: 0883-2889

DT Journal

LA English

CC 70-1 (Nuclear Phenomena)

AB Bremsstrahlung from 4.5-MeV e on a Pt target was used to produce nuclear isomers in 3 nuclides through (γ,γ') **excitation** of higher lying states and their **half- lives** were measured. The obtained values are 48.54 ± 0.05 min for **111mCd**, 1.660 ± 0.005 h for 113mIn, and 4.485 ± 0.004 h for **115mIn**. The intensity ratio of 497/336 keV γ transitions in the **decay** of **115mIn** was 1.04 ± 0.05 + 10-3. The methods of anal. and the results are discussed.

IT **Gamma** ray
(scattering of, by cadmium-111 and indium isotopes, inelastic)

IT **14191-71-0**, Indium-115, properties **14336-64-2**, Cadmium-111, properties
RL: PRP (Properties)
(nuclear energy levels of, **excitation** of isomeric, by γ-ray scattering)

RN 14191-71-0 HCAPLUS

CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

RN 14336-64-2 HCAPLUS

CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

L128 ANSWER 7 OF 42 HCAPLUS COPYRIGHT ACS on STN
AN 1997:499756 HCAPLUS
DN 127:199354
OREF 127:38487a,38490a
ED Entered STN: 07 Aug 1997
TI Determination of the **elemental distribution in a sample** using neutron-induced gamma-ray emission tomography
AU Spyrou, N. M.; Sharaf, J. M.; Rajeswaran, S.; Mesbahi, E.
CS Dep. Phys., Univ. Surrey, Guildford, GU2 5XH, UK
SO Journal of Radioanalytical and Nuclear Chemistry (**1997**), 217(2), 237-241
CODEN: JRNCDM; ISSN: 0236-5731
PB Elsevier
DT Journal
LA English
Journal Contents:
http://springerlink.metapress.com/content/xlrp7g350421/?p=38c9a261e0da4b58903406eb28bb3651&pi=156
AB The factor that affect accurate, quant. results to be obtained by neutron-induced γ-ray emission tomog. are stated. The technique, which is a combination of NAA with computerized γ-ray emission tomog., would be enhanced by the use of multiple detector assemblies, in geometrical configurations, which simultaneously record the γ-rays emitted and improve detection efficiency. Developments in the past few years in positron emission tomog. where scanners made of single scintillation block detectors, cut into smaller segments, to form individual crystal detector elements and packed in ring around the radioactive object, are discussed. The coincident detection efficiency for annihilation photons and **cascade γ-rays** for such systems are considered and the possibilities of carrying out NIGET with coincident γ-ray tomog. were explored while indicating some of the limitations.
IT Scintillation detectors
(calculated detection efficiencies for coincident γ-rays for Bi germanate system with 16 block detectors)
IT Neutron activation analysis
(determination of the elemental distribution in sample using neutron-induced gamma-ray emission tomog.)
IT **10198-40-0**, Cobalt-60, analysis **14265-76-0**, Hafnium-179, analysis
14336-64-2, Cadmium-111, analysis
RL: ANT (**Analyte**); ANST (Analytical study)
(calculated detection efficiencies for coincident γ-rays for Bi germanate system with 16 block detectors)
RN 10198-40-0 HCAPLUS
CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

RN 14265-76-0 HCAPLUS
CN Hafnium, isotope of mass 179 (CA INDEX NAME)

^{179}Hf

RN 14336-64-2 HCAPLUS
CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

L128 ANSWER 8 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1996:369263 HCAPLUS
DN 125:125256
OREF 125:23289a,23292a
ED Entered STN: 26 Jun 1996
TI Nuclide yields in (γ,γ')-, (.**gamma**
.,n)- and (γ,p) reactions at Eγmax = 13.3 MeV
AU Kungurov, F. R.; Muminov, T. M.; Mukhamedov, A. K.; Saidmuradov, Zh.; Salikhbaev, U. S.; Safarov, A. N.
CS Samarkand State University, Samarkand, Uzbekistan
SO Izvestiya Akademii Nauk, Seriya Fizicheskaya (**1996**), 60(1), 201-205
CODEN: IRAFEO
PB Nauka
DT Journal
LA Russian
CC 70-1 (Nuclear Phenomena)
AB Nuclide yields in photonuclear reactions were determined at the electron accelerator of Samarkand University. The results are planned to be used in activation anal.
ST nuclide yield photonuclear reaction electron accelerator
IT **Gamma** ray
(yields of various nuclides in (γ,n)-, (γ
,p)- and (γ,γ') reactions on medium and
heavy nuclei at **gamma**-ray maximum energy of 13.3 MeV)
IT **14336-64-2**, Cadmium-111, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(**excitation** of isomeric **state** of 111Cd in (
γ,γ') inelastic scattering on)
RN 14336-64-2 HCAPLUS
CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

IT **14191-71-0**, Indium-115, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(yields of metastable 114In and 115In in **gamma**-ray
bombardment of)
RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

L128 ANSWER 26 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1979:211284 HCAPLUS
DN 90:211284
OREF 90:33515a,33518a
TI **Excitation** of nuclear isomers by γ rays **from cobalt-60**
AU Watanabe, Yoshihisa; Mukoyama, Takeshi
CS Inst. Chem. Res., Kyoto Univ., Kyoto, Japan
SO Bulletin of the Institute for Chemical Research, Kyoto University (**1979**), 57(1), 72-82
CODEN: BICRAS; ISSN: 0023-6071
DT Journal
LA English
CC 70-2 (Nuclear Phenomena)
AB **Long-lived** isomeric states in stable nuclei 111Cd [**14336-64-2**] and 115In [**14191-71-0**] were **excited** by the Compton-scattered γ-rays from **60Co.** The flux of the scattered photons at resonance was calculated in the single-scattering approximation By using the observed γ activities of 111mCd and 115mIn and the calculated photon flux, the integral cross sections for the isomer production by photoexcitation of 111Cd and 115In were evaluated to be (3.5 ± 0.4) + 10-25 and (1.9 ± 0.1) + 10-25 cm2-eV, resp.
IT **Gamma** ray
(scattering of, by cadmium-111 and indium-115, isomer **excitation** in)
IT **14191-71-0**, properties **14336-64-2**, properties
RL: PRP (Properties)
(nuclear energy levels of, **excited** by γ-ray scattering, isomeric)
RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

RN 14336-64-2 HCAPLUS
CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

L128 ANSWER 31 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1973:460156 HCAPLUS

DN 79:60156

OREF 79:9657a,9660a

TI Nuclear quadrupole interaction studies by perturbed angular correlations

AU Haas, H.; Shirley, D. A.

CS Lawrence Berkeley Lab., Univ. California, Berkeley, CA, USA

SO Journal of Chemical Physics (**1973**), 58(8), 3339-55
CODEN: JCPSA6; ISSN: 0021-9606

DT Journal

LA English

CC 75-2 (Nuclear Phenomena)
Section cross-reference(s): 73

AB A comprehensive study was made of the applicability of **.gamma** .-ray angular correlations to the determination of quadrupole interactions in metals and insulating solids. Dynamic effects were studied in solns. and gases. A total of 14 γ-ray **cascades** were employed. Several nuclear spins were confirmed and the quadrupole moments of 10 **excited** nuclear **states** were determined or estimated from the data. Quadrupole coupling consts. were determined for **excited states** of the following nuclei in metallic host lattices of the same element: 44Sc, 99Ru, 111Cd, 117In, 187Re, 199Hg. Coupling consts. were also measured for the following isotope (lattice) combinations: 99Ru(Zn, Cd, Sn, Sb), 100Rh(Zn, Ru, Cu5Zn3, Pd2Al, PdPb2), 111Cd(In, Hg, Tl, CdSb, Cd3Ag, Zn, Ga, In, Sn, Sb, Bi, AuIn, InBi, In2Bi), 115In(Cd), 117In(Cd, Sn), 131I(Te), 181Ta(HfB2, HfSi2), 204Pb(Cd, In, Sn, As, Sb, Bi, Hg, Tl, PdPb2). Systematic variations of e2qQ with host-lattice structure were observed and host and solute properties were found to be separable to some extent for nontransition metals. The nuclei 111Cd, 115In, 117In, 199Hg, and 204Pb were used to determine a total of 50 quadrupole coupling consts. in insulators, including 20 with non-zero asymmetry parameters, which give oscillatory but aperiodic correlation functions. It was strikingly (and exhaustively) demonstrated that good detns. of quadrupole coupling consts. could be made following isomeric transitions (with no elemental transmutation) and β-**decay** (with elemental transmutation). However, in no case was it possible to derive a coupling constant from a γ-ray **cascade** preceded directly by e-capture **decay**, presumably because the sudden creation of a K-hole, and the Auger and "shake-off" events that follow, destroy the chemical integrity of the species under study. Relaxation times were determined for a number of liquid samples. Studies of dimethyl-111Cdm in various buffer gases showed that the spin memory was lost in 1 collision with heavy mols., but that light mols. required several collisions.

IT **Gamma** ray
(angular correlation of, quadrupole interactions and perturbed)

IT Nuclear energy level
(of atomic nuclei, quadrupole moments and spins of)

IT **14191-71-0, properties**
RL: RCT (Reactant); RACT (Reactant or reagent)
(quadrupole coupling of, in cadmium and cadmium insulating compds.)

RN 14191-71-0 HCAPLUS

CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

IT 14336-64-2, properties
RL: RCT (Reactant); RACT (Reactant or reagent)
(quadrupole interactions of)

RN 14336-64-2 HCAPLUS

CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

L128 ANSWER 33 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1970:138716 HCAPLUS

DN 72:138716

OREF 72:24773a,24776a

TI Determination of the amounts of elements in ore and products of their reprocessing by **excitation** of metastable **states** according to a (γ,γ'-) reaction

AU Kodiri, S.; Starchik, L. P.

CS USSR

SO Zavodskaya Laboratoriya (**1970**), 36(2), 191-5
CODEN: ZVDLAU; ISSN: 0321-4265

DT Journal

LA Russian

CC 76 (Nuclear Technology)

AB With the aid of the bremsstrahlung obtained from a 4.2-MeV electron linear accelerator (average output current of 50 μA) metastable states of the following nuclides were **excited**: 77Se, 87Sr, 89Y, 103Rh, 107Ag, 109Ag, 111Cd, 113In, 115In, 117Sn, 135Ba, 137Ba, 176Lu, 179Hf, 195Pt, 19 7Au, and 199Hg. Either a 0.95-mm Pt target or a 2-mm Pb target was used. Time of the irradiation was of 3-4 **half-lives** for each element. The activity induced was measured by a γ-ray spectrometer with 40 + 50 mm NaI(Tl) crystal. Based on photopeak area detns. the following sensitivity limits (in mg) were found: 77Sem 0.16, 87Srm 0.3, 89Ym 3.4, 103Rhm 2.01, 107Agm 0.24, 111Cdm 0.08, 115Inm 0.024, 117Snm 80.0, 135Bam 7.1, 137Bam 1.9, 176L um 0.96, 179Hfm 0.1, 195Ptm 0.2, 197Aum 0.1, 199Hgm 0.9.

IT **Gamma** rays, chemical and physical effects
(radioactivation by)

IT Analysis
(radioactivation, by **gamma** rays)

IT **13981-59-4**, analysis **14191-71-0**, analysis
14191-88-9, analysis **14265-76-0**, analysis
14336-64-2, analysis
RL: ANT (Analyte); ANST (Analytical study)
(determination of, by **gamma**-ray activation)

RN 13981-59-4 HCAPLUS

CN Tin, isotope of mass 117 (CA INDEX NAME)

^{117}Sn

RN 14191-71-0 HCAPLUS

CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

RN 14191-88-9 HCAPLUS

CN Platinum, isotope of mass 195 (CA INDEX NAME)

^{195}Pt

RN 14265-76-0 HCAPLUS

CN Hafnium, isotope of mass 179 (CA INDEX NAME)

^{179}Hf

RN 14336-64-2 HCAPLUS

CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

L128 ANSWER 40 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1951:46442 HCAPLUS
DN 45:46442
OREF 45:7890a-b
TI Natural radioactivity of indium
AU Cohen, S. G.
CS Hebrew Univ., Jerusalem
SO Nature (London, United Kingdom) (**1951**), 167, 779
CODEN: NATUAS; ISSN: 0028-0836
DT Journal
LA Unavailable
CC 3A (Nuclear Phenomena)
AB **Natural radioactivity was sought in 2 pairs of neighboring isobars: In113-Cd113 and In115-Sn115.** By use of a counter with an In cathode, some activity was found. The radiation could not be identified as K **x -rays** of Cd; this fact indicates that any K-capture half **life** must be >1014 yrs. β-Rays from the In have an energy of a few hundred e.kv., as determined from absorption measurements. In115 probably decays by β-emission to Sn115, with a half **life** of .apprx.1014 yrs. By use of counters with different gas fillings, results were obtained which are consistent with the presence of a small amount of Cd L **x-rays**, which may arise after decay of In113 by L-capture, but evidence is inconclusive owing to the small counting rates involved. With L-capture, a half **life** of .apprx.1012 yrs. is to be expected.
IT **14336-66-4**, Cadmium, isotope of mass 113
(from In115)
RN 14336-66-4 HCAPLUS
CN Cadmium, isotope of mass 113 (CA INDEX NAME)

^{113}Cd

IT **14191-71-0**, Indium, isotope of mass 115
(radioactivity of)
RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

L128 ANSWER 1 OF 42 HCAPLUS COPYRIGHT ACS on STN
AN 2005:636704 HCAPLUS
DN 144:75858
ED Entered STN: 22 Jul 2005
TI Investigation of formation of residual nuclei from natU by reactions with 660 MeV protons
AU Adam, J.; Katovsky, K.; Michel, R.; Balabekyan, A.; Tsoupko-Sitnikov, V. M.; Kalinnikov, V. G.; Pronskikh, V. S.; Solnyshkin, A. A.; Stegailov, V. I.; Mashnik, S. G.; Prael, R. E.; Gudima, K. K.
CS Joint Institute for Nuclear Research, Moscow, Russia
SO AIP Conference Proceedings (**2005**), 769(International Conference on Nuclear Data for Science and Technology, 2005, Part 1), 1043-1046
CODEN: APCPCS; ISSN: 0094-243X
PB American Institute of Physics
DT Journal
LA English
CC 70-1 (Nuclear Phenomena)
AB Thin natural uranium targets were irradiated by a 660 MeV proton beam from the Phasotron accelerator at the Joint Institute for Nuclear Research in Dubna, Russia. Cross-sections of the formation of residual nuclei natU(p,xpyn)AZ Res are determined by methods of gamma spectroscopy. Until now, 43 **long-lived** (T1/2 > 100 days) isotopes were observed and their cross-sections determined More than 350 intermediate-**lived** (1 day < T1/2 <100 days) and **short-lived** (T1/2 < 1 day) isotopes have been identified in the γ-spectra and many unanalyzed lines yet remain. Final results for 43 **long- lived** isotopes and upper cross-section limits for 27 **long -lived** isotopes are presented in this paper and compared with results by five different models.
IT Nuclear reaction fragments
(formation of residual nuclei from natU by reactions with 660 MeV protons)
IT **10198-40-0P**, Cobalt, isotope of mass 60, preparation
14265-77-1P, Hafnium, isotope of mass 178, preparation
14314-35-3P, Tin, isotope of mass 119, preparation
14336-66-4P, Cadmium, isotope of mass 113, preparation
378782-82-2P, **Niobium, isotope of mass 93m**(16.1 yr), preparation
RL: FMU (Formation, unclassified); PNU (Preparation, unclassified); FORM (Formation, nonpreparative); PREP (Preparation)
(formation of residual nuclei from natU by reactions with 660 MeV protons)
RN 10198-40-0 HCAPLUS
CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

RN 14265-77-1 HCAPLUS
CN Hafnium, isotope of mass 178 (CA INDEX NAME)

^{178}Hf

RN 14314-35-3 HCAPLUS
CN Tin, isotope of mass 119 (CA INDEX NAME)

^{119}Sn

RN 14336-66-4 HCAPLUS
CN Cadmium, isotope of mass 113 (CA INDEX NAME)

^{113}Cd

RN 378782-82-2 HCAPLUS
CN **Niobium, isotope of mass 93m**(16.1 yr) (CA INDEX NAME)

Nb

L128 ANSWER 2 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 2004:328024 HCAPLUS
DN 141:92038
ED Entered STN: 22 Apr 2004
TI Devgaon (H3) chondrite: classification and complex cosmic ray exposure history
AU Murty, S. V. S.; Rai, V. K.; Shukla, A. D.; Srinivasan, G.; Shukla, P. N.; Suthar, K. M.; Bhandari, N.; Bischoff, A.
CS Planetary and Geosciences Division, Physical Research Laboratory, Ahmedabad, 380009, India
SO Meteoritics & Planetary Science (**2004**), 39(3), 387-399
CODEN: MPSCFY; ISSN: 1086-9379
PB Meteoritical Society
DT Journal
LA English
CC 53-9 (Mineralogical and Geological Chemistry)
AB The Devgaon meteorite fell in India on Feb. 12, 2001 and was immediately collected. It is an ordinary chondrite having a number of SiO2-rich objects and some Ca, Al-rich inclusions. Olivines (Fa17-19) are fairly equilibrated, while pyroxenes (Fs4-20) are unequilibrated. Occasionally, shock veins are visible, but the bulk rock sample is very weakly shocked (S2). Chondrules and chondrule fragments are abundant. Based on chemical and petrol. features, Devgaon is classified as an H3.8 group chondrite. Several cosmogenic radionuclides ranging in **half-lives** from 5.6 d (52Mn) to 7.3 + 105 yr (26Al), noble gases (He, Ne, Ar, Kr, and Xe), and particle track d. were measured. The track d. in olivines from 5 spot samples varies between (4.6 to 9) + 106 cm-2 showing a small gradient within the meteorite. The light noble gases are dominated by cosmogenic and radiogenic components. Large amts. of trapped gases (Ar, Kr, and Xe) are present. In addition, (n, γ) products from Br and I are found in Kr and Xe, resp. The average cosmic ray exposure age of 101 ± 8 Ma is derived based on cosmogenic 38Ar, 83Kr, and 126Xe. The track production rates correspond to shielding depths of .apprx.4.9 to 7.8 cm, indicating that the stone suffered type IV ablation. Low 60Co, high (22Ne/21Ne)c, and large neutron produced excesses at 80Kr, 82Kr, and 128Xe indicate a complex exposure history of the meteoroid. In the first stage, a meter-sized body was exposed for nearly 108 yr in the interplanetary space that broke up in .apprx.50 cm-sized fragments about a million years ago (stage 2), before it was captured by the Earth.
IT Radionuclides, occurrence
RL: GOC (Geological or astronomical occurrence); OCCU (Occurrence)
(cosmogenic; classification and complex cosmic ray exposure history of Devgaon (H3) chondrite)
IT **10198-40-0**, Cobalt-60, occurrence **13965-99-6**, Xenon-129, occurrence **14683-11-5**, Xenon-131, occurrence
RL: GOC (Geological or astronomical occurrence); OCCU (Occurrence)
(classification and complex cosmic ray exposure history of Devgaon (H3) chondrite)
RN 10198-40-0 HCAPLUS
CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

RN 13965-99-6 HCAPLUS
CN Xenon, isotope of mass 129 (CA INDEX NAME)

^{129}Xe

RN 14683-11-5 HCAPLUS
CN Xenon, isotope of mass 131 (CA INDEX NAME)

^{131}Xe

L128 ANSWER 3 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 2003:146929 HCAPLUS
DN 138:176694
ED Entered STN: 27 Feb 2003
TI Differential effective cross sections of photonuclear reactions induced by bremsstrahlung of 11.8 MeV electrons in a thick tungsten target
AU Abibullaev, N. A.; Begimkulov, Kh. Kh.; Salikhbaev, U. S.
CS Samark. Gos. Univ., Samarkand, Uzbekistan
SO O'zbekiston Fizika Jurnali (**2002**), 4(4), 277-282
CODEN: UJPZAR
PB Izdatel'stvo Fan
DT Journal
LA Russian
CC 70-1 (Nuclear Phenomena)
AB In this work, the method of spherical activation spectrometry was used to measure the energy spectra and angular distribution of the bremsstrahlung from the MT-22S microtron electrons. Using the exptl. determined spectra of bremsstrahlung radiation with $E\gamma$(max) = 11.8 MeV and the data on **excitation** functions, the effective cross sections for 63 photonuclear reactions were studied.

IT **Gamma** ray interactions
(differential effective cross section measurements of photonuclear reactions induced by bremsstrahlung of 11.8-MeV electrons in thick tungsten target)

IT Nuclear reactions
(photonuclear; differential effective cross section measurements of photonuclear reactions induced by bremsstrahlung of 11.8-MeV electrons in thick tungsten target)

IT **14191-71-0**, Indium-115, reactions
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(differential effective cross section measurements of **gamma** -ray inelastic scattering and neutron photoprodn. on 115In induced by bremsstrahlung of 11.8-MeV electrons in thick tungsten target)
RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

IT **14336-64-2**, Cadmium-111, processes
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(differential effective cross section measurements of **gamma** -ray inelastic scattering on 111Cd with metastable **state excitation** induced by bremsstrahlung of 11.8-MeV electrons in thick tungsten target)
RN 14336-64-2 HCAPLUS
CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

IT **14265-76-0**, Hafnium-179, processes
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(differential effective cross section measurements of **gamma** -ray inelastic scattering on 179,180Hf with metastable **state excitation** induced by bremsstrahlung of 11.8-MeV electrons in thick tungsten target)
RN 14265-76-0 HCAPLUS
CN Hafnium, isotope of mass 179 (CA INDEX NAME)

^{179}Hf

L128 ANSWER 4 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1999:561975 HCAPLUS

DN 131:234316

ED Entered STN: 03 Sep 1999

TI Evaluation of a "best set" of average cross section measurements in the 235U(nth,f) neutron field

AU Mannhart, W.

CS Physikalisch-Technische Bundesanstalt Braunschweig, Braunschweig, Germany

SO Berichte des Forschungszentrums Juelich (**1999**), Juel-3660, 40-47
CODEN: FJBEE5; ISSN: 0366-0885

DT Report

LA English

CC 70-1 (Nuclear Phenomena)

AB Average cross sections measured in the thermal neutron-induced fission neutron field of 235U were evaluated with a total of 200 data. The evaluation comprised the measurement of 30 different neutron reactions. The results were given and compared with 2 previous evaluations. **X- ray** and γ-ray emission probabilities of 169Yb and the half-**life** of 153Sm were also studied.

IT **Gamma ray**
X-ray
(**x-ray** and γ-ray emission probabilities of 169Yb)

IT 15117-96-1, Uranium-235, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(average cross section measurements in thermal neutron-induced fission neutron field of)

IT **10198-40-0**, Cobalt-60, formation (nonpreparative)
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(average cross section measurements in thermal neutron-induced fission neutron field of 235U)

RN 10198-40-0 HCAPLUS

CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

IT **14191-71-0**, Indium-115, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(average cross section measurements in thermal neutron-induced fission neutron field of 235U)

RN 14191-71-0 HCAPLUS

CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

L128 ANSWER 5 OF 42 HCAPLUS

AN 1999:131580 HCAPLUS
DN 130:227082
ED Entered STN: 02 Mar 1999
TI Performance analysis for disposal of mixed low-level waste. II: Results
AU Waters, Robert D.; Gruebel, Marilyn M.
CS Sandia National Lab, Albuquerque, NM, 87185-1395, USA
SO Journal of Environmental Engineering (Reston, Virginia) (**1999**), 125(3), 258-266
CODEN: JOEEDU; ISSN: 0733-9372
PB American Society of Civil Engineers
AB Ten sites were evaluated as potential locations for disposal of mixed low-level radioactive waste using a simple methodol. Three environmental pathways (water, atmospheric, and inadvertent intruder) were analyzed using generic transport models that were modified for site-specific conditions. The results were summarized by grouping the 58 evaluated radionuclides according to their **half-lives** and environmental mobility and by their limiting pathway (i.e., the pathway providing the lowest permissible radionuclide concentration in disposed waste of the three evaluated pathways). The results indicate that all evaluated sites have the tech. capability for disposal of some radionuclides in the waste. For most radionuclides, the intruder scenarios were more important in determining permissible radionuclide concns. than the other pathways, particularly for arid sites. For humid sites, if the water pathway is not the most limiting and the permissible radionuclide concentration is high, a more sophisticated and rigorous anal. of the water pathway may not be warranted. However, if the permissible concentration is relatively low, more refined analyses may produce higher permissible concns. based on addnl. site characterization data.
IT Air pollution
Low-level radioactive wastes
Simulation and Modeling, physicochemical
(performance anal. for disposal of mixed low-level radioactive waste)
IT **10198-40-0**, Cobalt-60, occurrence **14336-66-4**, Cadmium-113, occurrence **15726-30-4**, Cesium-135, occurrence
RL: POL (Pollutant); OCCU (Occurrence)
(performance anal. for disposal of mixed low-level radioactive waste)
RN 10198-40-0 HCAPLUS
CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

RN 14336-66-4 HCAPLUS
CN Cadmium, isotope of mass 113 (CA INDEX NAME)

^{113}Cd

RN 15726-30-4 HCAPLUS
CN Cesium, isotope of mass 135 (CA INDEX NAME)

^{135}Cs

L128 ANSWER 9 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1995:601139 HCAPLUS

DN 123:67459

OREF 123:11869a,11872a

ED Entered STN: 09 Jun 1995

TI Photoexcitation of metastable states in 111Cd, 113In and 115In in the 5-30 MeV energy range

AU Safar, J.; Lakosi, L.; Veres, A.; Sekine, T.; Yoshihara, K.

CS Institute Isotopes, Hungarian Academy Sciences, Budapest, H-1525, Hung.

SO Proc. Int. Symp. Capture Gamma-Ray Spectrosc. Relat. Top., 8th (**1994**), Meeting Date 1993, 629-31. Editor(s): Kern, Jean.
Publisher: World Sci., Singapore, Singapore.
CODEN: 60VEAP

DT Conference

LA English

CC 70-1 (Nuclear Phenomena)

AB The cross section of 111Cd(γ,γ')111mCd, 113In(γ,γ')113mIn and 115In(.**gamma** .,γ')115mIn reactions has been studied in the 5-30 MeV **gamma**-energy region. Excitation functions have been calculated in the framework of a statistical γ-ray **cascade** model considering open nucleon emission channels and including preequil. contribution. At around the neutron separation energy, the calculated cross sections show reasonable agreement with the majority of exptl. data available in the literature. Above the (γ,n) threshold the integral cross section calculated for 115In agrees well with our recently measured value within the exptl. errors. An exptl. value of 8.3 ± 1.5 mb MeV has been found for the 113In(γ,.**gamma** .')113mIn reaction at 15 MeV endpoint energy also in agreement with our calcns.

IT **Gamma** ray
(photoexcitation of metastable states in 111Cd, 113In and 115In)

IT **14191-71-0**, Indium 115, properties **14336-64-2**, Cadmium 111, properties
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(photoexcitation of metastable states in)

RN 14191-71-0 HCAPLUS

CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

RN 14336-64-2 HCAPLUS

CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

L128 ANSWER 10 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1993:416233 HCAPLUS
DN 119:16233
OREF 119:2941a,2944a
ED Entered STN: 10 Jul 1993
TI Nuclear isomer **excitation** cross section in (γ,.
gamma.')m reactions at 4-15 MeV
AU Mazur, V. M.; Sokolyuk, I. V.; Bigan, Z. M.; Kobal, I. Yu.
CS Inst. Yad. Issled., Ukraine
SO Yadernaya Fizika (**1993**), 56(1), 20-5
CODEN: IDFZA7; ISSN: 0044-0027
DT Journal
LA Russian
CC 70-1 (Nuclear Phenomena)
AB Cross sections of γ inelastic scattering with **excitation** of isomer **states** σm of 77Se, 79Br, 87Sr, **111Cd**, **115In**, and 137Ba nuclei were measured at 4-15-MeV energies in ΔE = 0.5 MeV steps. For (γ,γ')m reactions below the (γ,n) thresholds the energy dependence of the isomer ratios η = σm/σtot was considered. For nuclei whose spins of the ground and isomer states differ by ΔJ = 4, the dependence η = f(A) is studied in a wide mass interval 77 < A < 197. Increase of η = f(A) with increase of A is in qual. agreement with the statistical model predictions.
IT **Gamma** ray
(nuclear isomer **state excitation** by inelastic scattering of)
IT **14191-71-0**, Indium-115, properties **14336-64-2**, Cadmium-111, properties
RL: PRP (Properties)
(nuclear isomer **state excitation** in, by γ-ray inelastic scattering)
RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

RN 14336-64-2 HCAPLUS
CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

L128 ANSWER 11 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1990:162388 HCAPLUS
DN 112:162388
OREF 112:27387a,27390a
ED Entered STN: 28 Apr 1990
TI The Torino, H6, meteorite shower
AU Bhandari, N.; Bonino, G.; Callegari, E.; Castagnoli, G. Cini; Mathew, K. J.; Padia, J. T.; Queirazza, G.
CS Ist. Cosmogeofis., Univ. Torino, Turin, Italy
SO Meteoritics (**1989**), 24(1), 29-34
CODEN: MERTAW; ISSN: 0026-1114
DT Journal
LA English
CC 53-9 (Mineralogical and Geological Chemistry)

AB A meteorite shower fell at Torino, Italy, on 18 May, 1988. Petrog. studies indicate that the stone is an H6 chondrite having features of moderate to severe shock. Chemical analyses of the meteorite are reported. Cosmic ray-produced 3He, 21Ne, and 126Xe yield an exposure age of .apprx.48 Myr. The cosmic ray track densities in 3 fragments range between 1.8 + 105 to 5 + 105/cm2 suggesting .apprx.99% mass ablation in the atmospheric Twelve radioisotopes with **half lives** ranging between 5.6 days to 7.3 + 105 yr were measured with high precision (2-10%). Marginal signals were observed for several short-**lived** nuclides and upper limits were obtained for the activity levels of 8 radionuclides (24Na, 48Cr, 57Ni, 47Sc, 47Ca, 59Fe, 42Ar, and 44Ti), some of which have not been hitherto detected in fresh falls. The data are generally consistent with the nuclide production by galactic cosmic rays when modulation due to the solar cycle is taken into consideration. The preatm. radius of the chondrite was .apprx.20 cm, consistent with track densities and activity levels of 60Co, 26Al, and other radionuclides.

IT Trace elements, occurrence
RL: OCCU (Occurrence)
(in chondrite meteorite, of Torino, Italy)

IT Fission fragments and products
RL: PRP (Properties)
(tracks of, d. of, in chondrite meteorite, ablation in atmospheric in relation to, of Torino, Italy)

IT **10198-40-0**, Cobalt-60, occurrence **13965-99-6**, Xenon-129, occurrence **14683-11-5**, Xenon-131, occurrence
RL: OCCU (Occurrence)
(in chondrite meteorite, of Torino, Italy)

RN 10198-40-0 HCAPLUS
CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

RN 13965-99-6 HCAPLUS
CN Xenon, isotope of mass 129 (CA INDEX NAME)

^{129}Xe

RN 14683-11-5 HCAPLUS
CN Xenon, isotope of mass 131 (CA INDEX NAME)

^{131}Xe

L128 ANSWER 12 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1989:453313 HCAPLUS
DN 111:53313
OREF 111:8993a,8996a
ED Entered STN: 20 Aug 1989
TI Dose conversion factors for air, water, soil and building materials
AU Holford, R. M.
CS Chalk River Nucl. Lab., Chalk River, ON, K0J 1J0, Can.
SO At. Energy Can. Ltd., [Rep.] AECL (**1988**), AECL-9825, 449 pp.
CODEN: AECRAN; ISSN: 0067-0367
DT Report
LA English
CC 8-1 (Radiation Biochemistry)
Section cross-reference(s): 59, 71
AB This report provides dose conversion factors (DCFs) for 496 isotopes in 7 exposure situations. The tables include values for **gamma** dose at the body surface, beta dose at the body surface, beta dose to skin, DCFs for 24 individual organs, and an estimate of the DCF for the ED equivalent calculated according to ICRP rules. These calcns. were carried out in support of the Canadian Nuclear Waste-management Program, and are intended to form part of the assessment of the likely dose to humans from long- **lived** nuclides escaping from a disposal site.
IT **10198-40-0**, biological studies
RL: BIOL (Biological study)
(dosimetry of metastable and, in organs from building materials and environmental contamination)
RN 10198-40-0 HCAPLUS
CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

IT **14191-71-0**, IN-115 element, biological studies
RL: ANT (Analyte); ANST (Analytical study)
(dosimetry of metastable and, in organs, from building materials and environmental contamination)
RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

L128 ANSWER 13 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1989:413874 HCAPLUS
DN 111:13874
OREF 111:2385a,2388a
ED Entered STN: 08 Jul 1989
TI Nuclear activation techniques for measuring direct and backscattered components of intense bremsstrahlung pulses
AU Anderson, J. A.; Carroll, J. M.; Taylor, K. N.; Carroll, J. J.; Byrd, M. J.; Sinor, T. W.; Collins, C. B.; Agee, F. J.; Davis, D.; et al.
CS Cent. Quantum Electron., Univ. Texas, Dallas, Richardson, TX, USA
SO Nuclear Instruments & Methods in Physics Research, Section B: Beam Interactions with Materials and Atoms (**1989**), Volume Date 1988, B40-B41(2), 1189-92
CODEN: NIMBEU; ISSN: 0168-583X
DT Journal
LA English
CC 71-1 (Nuclear Technology)
AB High-voltage e accelerators used for bremsstrahlung generation can produce intense pulses of radiation with different endpoint energies. The energy spectrum can be changed by varying the charging voltage or by softening the photons with Compton scattering in a low atomic number material. The high dose rate and the flexible spectrum capabilities of the Aurora accelerator were used to investigate the potential for measuring the bremsstrahlung spectrum by photoactivation of nuclear isomeric states. Recent success in calibrating lower intensity sources has shown that gram-sized targets of isotopes, such as 115In, can be used to sample the incident **x- rays** at several discrete gateway energies. When irradiated at these energies the targets are **excited** to metastable **states** with lifetimes suitable for conventional counting after the flash.

IT Bremsstrahlung
(nuclear activation techniques for measuring direct and backscattered components of pulses of)
IT Accelerators
(electron, bremsstrahlung pulses from, nuclear activation techniques for measuring direct and backscattered components of)
IT **14336-64-2**, Cadmium-111, properties
RL: PRP (Properties)
(isomeric activation of metastable, in measurement of direct and backscattered components of bremsstrahlung pulses)
RN 14336-64-2 HCAPLUS
CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

IT **14191-71-0**, Indium-115, properties
RL: PRP (Properties)
(photoactivation of, in measurement of direct and backscattered components of bremsstrahlung pulses)
RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

L128 ANSWER 14 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1987:563018 HCAPLUS

DN 107:163018

OREF 107:26081a,26084a

ED Entered STN: 31 Oct 1987

TI Spin-flip magnetic quadrupole transitions in tin-115 and tin-117

AU Fukuda, M.; Nagai, Y.; Irie, T.; Ejiri, H.

CS Dep. Phys., Osaka Univ., Toyonaka, 560, Japan

SO Nuclear Physics A (**1987**), A470(1), 1-12
CODEN: NUPABL; ISSN: 0375-9474

DT Journal

LA English

AB Electromagnetic properties of low-lying **excited states** in 115Sn and 117Sn were studied by means of in-beam and off-beam e. **gamma**. spectroscopy. Magnetic quadrupole (M2) γ matrix elements between the 1h11/2 and 1g7/2 quasi-n states in the Sn isotopes were reduced by factors gγeef/g.**gamma** .free = 0.21-0.29 over single quasi-particle values. The reduction rates are about the same as those for analogous quasi-p transitions. There is, however, a finite difference between the renormalization factor geff/gfree for the M2 γ-**decays** and those for the analogous 1st-forbidden β-**decays**.

IT Electron internal conversion
Gamma ray
(from tin isotopes, from deuteron bombardment of indium-115 and **decay** of indium-117)

IT **14191-71-0**, Indium-115, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(deuteron bombardment of, neutrons from)

RN 14191-71-0 HCAPLUS

CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

IT **13981-59-4**, Tin-117, properties
RL: PRP (Properties)
(nuclear energy levels of, from **decay** of indium-117, spin-flip magnetic quadrupole transitions of)

RN 13981-59-4 HCAPLUS

CN Tin, isotope of mass 117 (CA INDEX NAME)

^{117}Sn

L128 ANSWER 16 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1986:77103 HCAPLUS
DN 104:77103
OREF 104:12143a,12146a
ED Entered STN: 08 Mar 1986
TI The strength of the spallation neutron flux of SINQ for radiation damage fusion technology
AU Hegedus, F.; Green, W. V.; Stiller, P.; Green, S.; Herrnberger, V.; Stiefel, U.; Victoria, M.
CS Swiss Fed. Inst. Reactor Res., Wuerenlingen, 5303, Switz.
SO EIR-Ber. (**1985**), 579, 40 pp.
CODEN: EIBEDK; ISSN: 0531-6758
DT Report
LA English
CC 71-2 (Nuclear Technology)
Section cross-reference(s): 70
AB The SINQ spallation n source was simulated and its source strength measured in terms of the radiation damage parameters: total flux of spallation n with energy E <1.0 = MeV; spectral energy distribution; He and displacement damage production rates; and their ratio. This simulation used the p beam of the TRIUMF accelerator in Canada, and its molten Pb beam stop as the source of spallation n. The He production per p of beam was measured for several materials by vacuum extraction, inside a calibrated mass spectrograph; the spectrum, flux extraction inside a calibrated mass spectrograph; the spectrum, flux intensity, and the displacement radiation damage parameter were measured by multiple foil activation flux-unfolding combined with radiation damage calcns. The He/dpa (displacements per atom) ratio matches the fusion reactor 1st wall case; but the He production in Fe per mA-yr at a radial distance of 15 cm is estimated, to be 6 appm compared to 310 appm at the end of **life** in the 1st wall of NET.
IT Radiation, chemical and physical effects
(damage by, of fusion reactor first wall materials)
IT Nuclear fusion reactors
(first walls, radiation damage to, spallation neutron flux in relation to)
IT **10198-40-0P**, preparation
RL: PREP (Preparation)
(production of, by neutron bombardment of copper or nickel, **gamma** ray activities of product nuclei in relation to)
RN 10198-40-0 HCAPLUS
CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

IT **14191-71-0P**, preparation
RL: PREP (Preparation)
(production of, by neutron bombardment of indium, **gamma** ray activities of product nuclei from)
RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

L128 ANSWER 17 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1985:156656 HCAPLUS
DN 102:156656
OREF 102:24529a,24532a
ED Entered STN: 04 May 1985
TI Long-**lived** radionuclides in low-level waste
AU Cline, James E.; Coe, Larry J.
CS Sci. Appl., Inc., USA
SO Proc. Annu. Participants' Inf. Meet.: Low-Level Waste Manage. Program (**1983**), Issue 8308106, DE84 004134, 404-116 Publisher: NTIS, Springfield, Va.
CODEN: 53ITAD
DT Conference
LA English
CC 71-11 (Nuclear Technology)
AB The radionuclide contents were studied of LWR-generated low-level waste. The objectives of the study are: (1) to analyze, using verified techniques, 150 archived samples for specified β- and **x- ray**-emitting nuclides that had not previously been analyzed; (2) to analyze 20 new samples obtained from operating plants for all relevant nuclides and compare them to previous data to ascertain trends; (3) to develop empirical scaling factors through the use of which concns. of hard-to-analyze nuclides can be estimated from analyses of the γ-ray emiting nuclides. The new samples are analyzed and the results are summarized and interpreted. Scaling factor development is discussed. Factors are presented that relate 63Ni and 59Ni to 60Co for PWRs and to 58Co for BWRs, 90Sr to 137Cs for BWRs and 241Pu, 239Pu, 241Am, and 244Cm to 144Ce for all LWRs.
ST radioelement radioactive waste LWR; scaling factor radioelement radioactive waste
IT Radioactive wastes
(low-level, determination of long-**lived** radionuclides in, from LWR, scaling factors for)
IT **10198-40-0**, analysis **15726-30-4**, analysis
RL: ANT (Analyte); ANST (Analytical study)
(determination of, in low-level radioactive wastes)
RN 10198-40-0 HCAPLUS
CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

RN 15726-30-4 HCAPLUS
CN Cesium, isotope of mass 135 (CA INDEX NAME)

^{135}Cs

L128 ANSWER 18 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1982:188345 HCAPLUS
DN 96:188345
OREF 96:30941a,30944a
TI Nuclear data for **x**- or gamma-**ray** spectrometer efficiency calibrations
AU Hoppes, D. D.; Hutchinson, J. M. R.; Schima, F. J.; Unterweger, M. P.
CS Natl. Bur. Stand., Washington, DC, USA
SO NBS Special Publication (United States) (**1982**), 626, 85-99
CODEN: XNBSAV; ISSN: 0083-1883
DT Journal
LA English
CC 70-1 (Nuclear Phenomena)
Section cross-reference(s): 71, 73

AB **Half-lives** measured with reference ionization chambers are reported for 22Na, 24Na, 46Sc, 51Cr, 54Mn, 57Co, 58Co, 59Fe, 60Co, 65Zn, 67Ga, 75Se, 85Sr, 88Y, 99Mo, 99mTc (two chemical forms), 109Cd, 110mAg, 111In, 113Sn, 123I, 125I, 125Sb, 127Xe, 131I, 131mXe, 133Xe, 133Ba, 134Cs, 137Cs, 139Ce, 140Ba, 140La, 141Ce, 144Ce, 152Eu, 153Gd, 154Eu, 155Eu, 169Yb, 181W, 192Ir, 195Au, 198Au, 201Tl, 203Hg, 203Pb, 207Bi, and 228Th. γ-Ray probabilities per decay measured with calibrated Ge spectrometry systems are given for 88Y, 99Mo, 125Sb, 131I, 154Eu, and 228Th. The γ-**ray** to K-**x**-**ray** emission-rate ratio for 109Cd and the γ-ray probability per decay for 241Am as measured with NaI(Tl) systems of known efficiency are given.

IT **X-ray** spectrometry
(data for calibrations in)
IT Gamma ray
(spectrometry, data for calibrations in)
IT Nuclear spectrometers
(gamma-ray, efficiency calibration of germanium)
IT **14683-11-5**, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(decay of metastable, half-**life** and γ-rays from)
RN 14683-11-5 HCAPLUS
CN Xenon, isotope of mass 131 (CA INDEX NAME)

^{131}Xe

IT **10198-40-0**, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(decay of, half-**life** and γ-rays from)
RN 10198-40-0 HCAPLUS
CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

L128 ANSWER 19 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1982:76244 HCAPLUS
DN 96:76244
OREF 96:12427a,12430a
TI Decay calculations on medium-level and actinide-containing wastes from the LWR fuel cycle. Part I. Basic data evaluation including activity and thermal decay power
AU Haug, H. O.
CS Inst. Heisse Chem., Kernforschungszent. Karlsruhe, Karlsruhe, Fed. Rep. Ger.
SO Kernforschungszent. Karlsruhe, [Ber.] KFK (**1981**), KFK 3221, 71 pp.
CODEN: KKBRAY; ISSN: 0303-4003
DT Report
LA German
CC 71-11 (Nuclear Technology)
Section cross-reference(s): 55, 60

AB A number of basic data on medium-level and actinide-containing waste streams from the LWR fuel cycle were evaluated, and the activity and thermal decay power were calculated for the nuclide inventories of cladding hulls and fuel assembly structural materials, for feed clarification sludge, medium-level aqueous process waste, low-level solid transuranium waste and for medium-level reactor operating waste. The activity as a function of decay time of the medium-level wastes decreases within 500 to 600 yr by 1-3 orders of magnitude and is at the same time .apprx.1-2 orders of magnitude lower than the activity of the high-level waste. The thermal decay power of the medium-level wastes decreases after 10-100 yr by .apprx.3 orders of magnitude and is about a factor of 10-100 less than that of high-level waste. In the very long term, the residual activity (and thermal power) decreases only slowly due to the long **half-lives** of the dominant actinides. The activity after >1000 yr is .apprx. 1-2 orders of magnitude lower than that of high-level waste, the low-level transuranium waste by a factor 10 to 4, resp. The activity per unit volume of the packaged waste of the medium-level and actinide-containing wastes, owing to the bigger volume of the conditioned wastes, is lower by 2-4 orders of magnitude up to .apprx.500 yr. After >1000 yr the activities per unit volume are lower by a factor of 20-200 than that of high-level waste.

IT Radioactive wastes
(actinide-containing and medium-level, from LWR fuel cycle, decay calcns. on)
IT Actinides
Fission fragments and products
RL: PRP (Properties)
(activity of, in aqueous medium-level radioactive wastes)
IT Nuclear reactor fuels and fuel elements
(cycles, plutonium estimated losses in LWR)
IT **14314-35-3**, properties **14390-73-9**, properties
RL: PRP (Properties)
(nuclear decay calcns. on metastable, in radioactive waste)
RN 14314-35-3 HCAPLUS
CN Tin, isotope of mass 119 (CA INDEX NAME)

^{119}Sn

RN 14390-73-9 HCAPLUS
CN Tellurium, isotope of mass 125 (CA INDEX NAME)

^{125}Te

IT **10198-40-0**, properties
RL: PRP (Properties)
(nuclear decay calcns. on radioactive wastes containing)
RN 10198-40-0 HCAPLUS
CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

L128 ANSWER 20 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1981:522261 HCAPLUS
DN 95:122261
OREF 95:20397a,20400a
TI Beta decay rates for s-process studies
AU Cosner, Kenneth; Truran, James W.
CS Dep. Astron., Univ. Illinois, Urbana, IL, USA
SO Astrophysics and Space Science (**1981**), 78(1), 85-94
CODEN: APSSBE; ISSN: 0004-640X
DT Journal
LA English
CC 70-5 (Nuclear Phenomena)

AB The rates for a variety of β decay processes were determined as a function of temperature for nuclei which can participate in the s-process production of heavy elements, occurring in the presence of the 22Ne(α,n)25Mg n source operating in the convective He shells of thermally pulsing stars. Specifically, calculated **half-lives** are presented for e- emission, e+ emission, and e- capture over the temperature range 108-109 K.

IT Stars
(nucleosynthesis in, slow neutron capture, rate calcns. for β decay processes as function of temperature in relation to)

IT Atomic nuclei
(nucleosynthesis of, rate calcns. for β decay processes as function of temperature in relation to s-process)

IT Beta decay
Electron-capture decay
(rate calcns. for, as function of temperature, s-process nucleosynthesis in relation to)

IT **10198-40-0**, reactions **14191-71-0**, reactions
RL: PRP (Properties)
(beta decay half-**life** of, temperature dependence of, s-process nucleosynthesis in relation to)

RN 10198-40-0 HCAPLUS
CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

L128 ANSWER 21 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1981:146578 HCAPLUS

DN 94:146578

OREF 94:23893a,23896a

TI High resolution γ spectra of 40-44 MeV photon activation products. Part 3. A summary of γ rays, radionuclides and nuclear interferences observed

AU Williams, D. R.; Hislop, J. S.

CS Environ. Med. Sci. Div., AERE, Harwell, UK

SO U. K. At. Energy Res. Establ., Rep. (**1980**), AERE-R 9022, 32 pp. CODEN: UKRGAL; ISSN: 0436-9734

DT Report

LA English

CC 70-2 (Nuclear Phenomena)
Section cross-reference(s): 79

AB A table of γ-rays observed in the high resolution **.gamma** . ray spectra of 40-44 MeV γ photon activation products is presented. This table is arranged in order of increasing **.gamma** .-ray energy and the parent isotopes, their **half-lives** and their inactive precursors are identified. Nuclear interferences caused by production of an active isotope from different parent elements have been identified and evaluated quant. These are also tabulated.

ST activation analysis **gamma** table

IT **Gamma** ray
(tables of)

IT Radiochemical analysis
(activation, **gamma**-ray tables for)

IT **10198-40-0**, uses and miscellaneous **14191-71-0**, uses and miscellaneous
RL: USES (Uses)
(nuclear interference of, in activation anal.)

RN 10198-40-0 HCAPLUS

CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

RN 14191-71-0 HCAPLUS

CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

L128 ANSWER 22 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1980:223010 HCAPLUS
DN 92:223010
OREF 92:35971a,35974a
TI Dose-rate conversion factors for external exposure to photon and electron radiation from radionuclides occurring in routine releases from nuclear fuel cycle facilities
AU Kocher, D. C.
CS Health Saf. Res. Div., Oak Ridge Natl. Lab., Oak Ridge, TN, 37830, USA
SO Health Physics (**1980**), 38(4), 543-621
CODEN: HLTPAO; ISSN: 0017-9078
DT Journal
LA English
CC 71-9 (Nuclear Technology)
Section cross-reference(s): 8
AB Dose-rate conversion factors for external exposure to photon and e radiation were calculated for 240 radionuclides of potential importance in routine releases from nuclear fuel cycle facilities. Exposure modes considered are immersion in contaminated air, immersion in contaminated water, and irradiation from a contaminated ground surface. For each exposure mode, dose-rate conversion factors for photons and e were calculated for tissue-equivalent material at the body surface of an exposed individual. Dose-rate conversion factors for photons only were calculated for 22 body organs.
IT Actinides
Fission fragments and products
Radioelements, biological studies
RL: BIOL (Biological study)
(dose rate at body surface and dose-conversion factors for various organs exposed to)
IT Nuclear reactor fuel reprocessing
(dose-rate conversion factors for external exposure to radiation from radioelements released in)
IT **Gamma** ray
(dose-rate conversion factors for, for various radioelements)
IT Dosimetry
(dose-rate conversion factors, for radioelements occurring in routine releases from fuel reprocessing facilities)
IT **10198-40-0**, biological studies **14191-71-0**, biological studies
RL: BIOL (Biological study)
(dose rate at body surface and dose-conversion factors for various organs exposed to)
RN 10198-40-0 HCAPLUS
CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

L128 ANSWER 23 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1980:157197 HCAPLUS
DN 92:157197
OREF 92:25355a,25358a
TI A consistent set of nuclear-parameter values for absolute INAA
AU Heft, Robert E.
SO DOE Symposium Series (**1979**), Volume Date 1978, 49(Comput. Act. Anal. Gamma-Ray Spectrosc.), 495-510
CODEN: DOESD6; ISSN: 0164-2022

AB **Gamma** spectral anal. of irradiated material can be used to determine absolute disintegration rates for specific radionuclides. These data, together with measured values for the thermal and epithermal neutron fluxes and irradiation, cooling, and counting-time values, are all the exptl. information required to do absolute instrumental neutron activation anal. (INAA). The calcns. required to go from product photon emission rate to target nuclide amount depend on values used for the thermal-neutron-capture cross section, the resonance absorption integral, the **half- life**, and photon branching ratios. Values for these parameters were determined by irradiating and analyzing a series of elemental stds. The results of these measurements were combined with values reported by other workers to arrive at a set of recommended values for the consts. Values for 114 nuclides are listed.

IT Radiochemical analysis
(neutron activation, instrumental, nuclear parameter values for absolute)
IT **13981-59-4**, properties **14191-71-0**, properties **14191-88-9**, properties **14336-64-2**,
RL: PRP (Properties)
(**gamma** rays from metastable, following neutron capture in activation anal., consts. for)
RN 13981-59-4 HCAPLUS
CN Tin, isotope of mass 117 (CA INDEX NAME)

^{117}Sn

RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

RN 14191-88-9 HCAPLUS
CN Platinum, isotope of mass 195 (CA INDEX NAME)

^{195}Pt

RN 14336-64-2 HCAPLUS
CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

IT **13967-67-4**, properties **14191-71-0**, properties **14191-88-9**, properties **14265-76-0**,
(neutron cross sections of, for activation anal.)
RN 13967-67-4 HCAPLUS
CN Iridium, isotope of mass 193 (CA INDEX NAME)

^{193}Ir

RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

RN 14191-88-9 HCAPLUS
CN Platinum, isotope of mass 195 (CA INDEX NAME)

^{195}Pt

RN 14265-76-0 HCAPLUS
CN Hafnium, isotope of mass 179 (CA INDEX NAME)

^{179}Hf

L128 ANSWER 24 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1980:48454 HCAPLUS

DN 92:48454

OREF 92:7927a,7930a

TI **Excitation** of indium-115, indium-113, and cadmium-111 nuclei in the photo-free annihilation of positrons

AU Vishnevskii, I. N.; Zheltonozhskii, V. A.; Svyato, V. P.; Trishin, V. V.

CS Inst. Yad. Issled., Leningrad, USSR

SO Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya (**1979**), 43(10), 2142-7
CODEN: IANFAY; ISSN: 0367-6765

DT Journal

LA Russian

CC 70-2 (Nuclear Phenomena)

AB **Excitation** of the isomeric levels of 336.2 keV in 115In [**14191-71-0**], 391.7 keV in 113In [14885-78-0], and 150.8 and 245.4 keV in 111Cd [**14336-64-2**] in photon-free e+ annihilation was studied. Natural In or Cd targets together with a planar 64Cu e+ sources were in a sandwich-type arrangement. The **deexcitation . gamma.**-rays of the above levels was measured with Ge(Li) detectors. The cross sections of the level **excitation** was determined Direct **excitation** of the above levels with e+ and **excitation** by γ-rays was excluded. The levels at 1077.8 keV in 115In and 1129.4 keV in 113In were **excited** by the photon-free positron annihilation and the levels at 336.2 and 391.7 keV, resp., were populated by the **deexcitation** of the higher levels. The level populating the states at 150.8 and 245.4 keV in 111Cd is not known. The cross sections agree with those of T. Mikoyama et al. (1972) but do not agree with theor. predictions of D. P. Grechukhin et al. (1977).

IT **Gamma** ray
(from cadmium-111 and indium isotope level **deexcitation**)

IT **14191-71-0**, properties **14336-64-2**, properties
RL: PRP (Properties)
(nuclear energy level **excitation** of, by positron annihilation)

RN 14191-71-0 HCAPLUS

CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

RN 14336-64-2 HCAPLUS

CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

L128 ANSWER 25 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1979:547062 HCAPLUS
DN 91:147062
OREF 91:23615a,23618a
TI The 852 keV first-forbidden beta transition in cadmium-115g
AU Lakshminarayana, S.; Rao, M. Srinivasa; Rao, V. Seshagiri; Sastry, D. L.
CS Lab. Nucl. Res., Andhra Univ., Waltair, India
SO Nuovo Cimento della Societa Italiana di Fisica, A: Nuclei, Particles and Fields (**1979**), 52A(1), 92-8
CODEN: NIFAAM; ISSN: 0369-4097
DT Journal
LA English
CC 70-2 (Nuclear Phenomena)
AB βγ Angular-correlation expts. were performed on the 852 keV β-261 keV **γ cascade** in the ground-state decay of 115Cd [14336-68-6] by using a conventional fast-slow coincidence set-up. The present integral-correlation experiment confirmed a 3/2- spin-parity assignment for the 597-keV level in **115In** [**14191-71-0**], while the differential-correlation measurements revealed a small energy dependence of the correlation function. The nonunique 1st-forbidden 852-keV β transition does not obey the ξ-approximation
IT Gamma ray
(of indium-115, from decay of cadmium-115)
IT 14336-68-6, reactions
RL: PRP (Properties); RCT (Reactant); RACT (Reactant or reagent)
(decay of, gamma-ray spectrum in)
IT 12587-47-2P
RL: PREP (Preparation)
(from cadmium-115 decay)
IT 14191-71-0, properties
RL: PRP (Properties)
(nuclear energy levels of, from cadmium-115 decay)

L128 ANSWER 27 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1979:111154 HCAPLUS

DN 90:111154

OREF 90:17445a,17448a

TI **Nuclear excitation of indium-115 by positron annihilation with K-shell electrons**

AU Watanabe, Yoshihisa; Mukoyama, Takeshi; Shimizu, Sakae

CS Inst. Chem. Res., Kyoto Univ., Kyoto, Japan

SO Physical Review C: Nuclear Physics (**1979**), 19(1), 32-7
CODEN: PRVCAN; ISSN: 0556-2813

DT Journal

LA English

CC 70-2 (Nuclear Phenomena)

AB When a e+ annihilates with a K-shell e-, the excess energy liberated may be given to the nucleus involved. When this energy is just the right energy for any **excited state** within its level width of a fraction of an eV, nuclear excitation can be expected, and if the excited level **cascades** down to an isomeric state with appreciable lifetime, the occurrence of this annihilation mode can be confirmed by observing γ-transitions or conversion e- from this isomeric level. **Gamma-rays from 115mIn** [**14191-71-0**] were observed after irradiation of natural In foils by e+ from 64Cu. By using the observed induced γ activity of 115mIn and assuming this phenomenon to be a 2-step process, the cross sections of nuclear excitation by e+ annihilation for the 1078- and 1464-keV levels of 115In were evaluated as (3.9 ± 1.4) + 10-24 cm2 and (1.4 ± 0.5) + 10-22 cm2, resp.

IT 12585-85-2
RL: RCT (Reactant); RACT (Reactant or reagent)
(annihilation of, with K-shell electrons, cross sections for excitation of indium-115 levels by)

IT 14191-71-0, properties
RL: PRP (Properties)
(nuclear energy levels of, excited by positron annihilation with K-shell electrons, cross sections for)

L128 ANSWER 28 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1976:96564 HCAPLUS

DN 84:96564

OREF 84:15679a,15682a

TI Determination of the sign and magnitude of the nuclear quadrupole interaction by β-γ directional correlations

AU Raghavan, R. S.; Raghavan, P.; Kaufmann, E. N.

CS Bell Lab., Murray Hill, NJ, USA

SO Physical Review C: Nuclear Physics (**1975**), 12(6), 2022-32
CODEN: PRVCAN; ISSN: 0556-2813

DT Journal

LA English

CC 70-2 (Nuclear Phenomena)

AB Expts. are reported which demonstrate that the sign and magnitude of the quadrupole interaction of **excited** nuclear **states** can be reliably determined by means of time-differential β-.**gamma** . directional correlations with radioactive sources embedded in noncubic single crystals. The 828-keV level of 115In [**14191-71-0**] and the 247-keV level of 111Cd [**14336-64-2**], fed by an allowed and a unique first-forbidden β-**decay**, resp., were investigated by this method. The coupling consts. e2qQ/h of these levels in Cd metal at 298°K, are -146(5) MHz for 115In and +125(4) MHz for 111Cd. The pos. coupling constant for 111Cd in Cd coupled with a pos. quadrupole moment Q of this level implies a pos. elec. field gradient in Cd confirming recent theor. predictions. The neg. e2qQ for the 115In level in Cd metal correspondingly indicates a neg. Q for this level in conformity with its description as a member of a K = 1/2 rotational band. A discussion is included of the major concepts underlying the various methods available now for determination of the sign of e2qQ. Also a detailed account of theor. formulas necessary to evaluate allowed and forbidden β-.**gamma** . perturbed angular correlations and a brief discussion of the significance of the technique for further studies of nuclear quadrupole effects in materials are given.

IT **Gamma** ray
(angular correlations of, with β particles, nuclear quadrupole interactions from)

IT Nuclear energy level
(of cadmium-111 and indium-115, quadrupole interactions of)

IT 14191-71-0, properties
RL: PRP (Properties)
(nuclear energy levels of, from decay of metastable cadmium-115, quadrupole interactions of)

RN 14191-71-0 HCAPLUS

CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

IT 14336-64-2, properties
RL: PRP (Properties)
(nuclear energy levels of, from silver-111 decay, quadrupole interactions of)

RN 14336-64-2 HCAPLUS

CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

L128 ANSWER 29 OF 42 HCAPLUS

AN 1975:585169 HCAPLUS
DN 83:185169
OREF 83:29019a,29022a
TI **Short**-**lived** isotopes for use in nondestructive activation analysis
AU Bode, P.; De Bruin, M.; Korthoven, P. J. M.
CS Interuniv. React. Inst., Delft, Neth.
SO Journal of Radioanalytical Chemistry (**1975**), 26(1), 209-13
CODEN: JRACBN; ISSN: 0022-4081
DT Journal
LA English
CC 71-8 (Nuclear Technology)
Section cross-reference(s): 79
AB To obtain reliable data on **short**-**lived** isotopes for use in thermal neutron activation anal., expts. were carried out by using a fast rabbit transfer system. **Half**-**lives** of 28 **short**-**lived** isotopes were measured by using a counting system with a fixed dead-time. A Ge(Li) spectrometry system was used to determine the most important γ-ray energies and intensities of these isotopes. For the **half**-**lives**, an accuracy of better than 1% was attained, whereas for the γ-ray energies an accuracy of 0.1 keV was attained.
IT Radioelements, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(**decay** of, **half**-**lives** for)
IT **Gamma** ray
(from radioelements of interest in activation anal.)
IT Radiochemical analysis
(neutron activation, **short**-**lived** radioelement **halflife** for)
IT **14265-76-0**, reactions **14265-77-1**, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(**decay** of metastable, **half**-**life** for)
RN 14265-76-0 HCAPLUS
CN Hafnium, isotope of mass 179 (CA INDEX NAME)

^{179}Hf

RN 14265-77-1 HCAPLUS
CN Hafnium, isotope of mass 178 (CA INDEX NAME)

^{178}Hf

IT **14191-71-0**, reactions **14265-77-1**, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(neutron capture by, γ-rays from)
RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

RN 14265-77-1 HCAPLUS
CN Hafnium, isotope of mass 178 (CA INDEX NAME)

^{178}Hf

L128 ANSWER 30 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1974:54701 HCAPLUS

DN 80:54701

OREF 80:8863a,8866a

TI Gamma ray-multiplicity measurements for (α,p), (α,α'), (d,α), (p,α), (d,p), and (p,p') reactions

AU Degnan, J. H.; Cohen, B. L.; Rao, G. R.; Chan, K. C.; Shabason, L.

CS Nucl. Phys. Lab., Univ. Pittsburgh, Pittsburgh, PA, USA

SO Physical Review C: Nuclear Physics (**1973**), 8(6), 2255-66
CODEN: PRVCAN; ISSN: 0556-2813

DT Journal

LA English

CC 75-2 (Nuclear Phenomena)

AB By using a method introduced previously, measurements were made of the γ-ray multiplicity Nγ (the average number of γ-rays emitted in the **decay** of residual nuclei left by nuclear reactions) as a function of **excitation** energy E* for (p,α) and (d,α) reactions on 51V, 56Fe, and 57Fe targets; (α,p) reactions on 51V, 56Fe, 57Fe, 58Ni, 64Ni, 93Nb, and Ag; (α,α') reactions on 51V, 55Mn, 56Fe, 57Fe, 59Co, and 64Ni; (d,p) reactions on 51V, 55Mn, 56Fe, Ag, and 119Sn; and (p,p') reactions on 56Fe, 112Sn, and 122Sn. Bombarding energies ranged from 12 to 19 MeV. Nγ was observed to be generally between 1 and 5 for E* between 3 and 10 MeV for the (p,p'), (d,p), (d,α), (p,α), and (α,α') reactions investigated, and somewhat higher for the (α,p) reactions. Nγ increases with E*, and is larger for higher angular momentum transfer reactions although it is not as much larger as angular momentum transfer considerations alone would suggest. (This can be explained as a level-d. effect for compound-nucleus reactions- the average angular momentum of the **states excited** by the reactions is severely limited by the level-d. spin-cutoff parameter). The dependence of Nγ on the average excess angular momentum of the residual nuclei was investigated by using calculated spin distributions for the residual nuclei. This dependence is similar to that for n capture Nγ's-Nγ increases with excess angular momenta for excess angular momenta of >2 or 3 units.

IT Gamma ray
(from nuclear reactions, multiplicity of)

IT **14314-35-3**, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(deuteron bombardment of, multiplicity of γ-rays from)

RN 14314-35-3 HCAPLUS

CN **Tin, isotope of mass 119**

^{119}Sn

IT **10198-40-0**, properties
RL: RCT (Reactant); RACT (Reactant or reagent)
(**gamma rays from**, from α-particle bombardment of iron-57, multiplicity of)

RN 10198-40-0 HCAPLUS

CN **Cobalt, isotope of mass 60**

^{60}Co

L128 ANSWER 32 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1971:428388 HCAPLUS
DN 75:28388
OREF 75:4471a,4474a
TI Interpolative formulas for average nuclear level spacing and total radiation width
AU Musgrove, Anthony R.
CS Res. Establ., Aust. At. Energ. comm., Lucas Heights, Australia
SO Aust. At. Energy Comm., AAEC/E [Rep.] (**1970**), AAEC/E211, 6 pp.
CODEN: AATCAZ
DT Report
LA English
CC 75 (Nuclear Phenomena)
AB The free gas model formula for nuclear level ds. was used to interpolate unknown level spacings. The level d. parameter was fitted semi-empirically to give good fits to all exptl. measured level spacings. A formula for total radiation width is given which relates this quantity to the mass number, the average level spacing, and the excitation energy. Compound nuclei which have a long-**lived** isomeric state were found to have, on average, a radiation width 25 less than for non-isomeric compound nuclei. No correlation between radiation widths and n strength function was observed within the limits of accuracy of the exptl. data, contrary to some previous suggestions. Tables of calculated and measured resonance parameters are given for target nuclei in the range 60 < A < 203. The calculated 30 keV capture cross section is compared with measured and semiempirical data (Allen et al., 1970) and with the calculated values of Benzi and Reffo (1969).
IT Nuclear energy levels
(spacing and width of, calcn. of)
IT **Gamma** rays
(transitions of, calcn. of)
IT **14191-71-0**, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(neutron capture cross sections and radiation width of, calcn. of)
RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

IT **10198-40-0**, properties
RL: PRP (Properties)
(nuclear energy level spacing and radiation width of, calcn. of)
RN 10198-40-0 HCAPLUS
CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

L128 ANSWER 34 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1970:95576 HCAPLUS

DN 72:95576

OREF 72:17365a,17368a

TI Photon and electron **excitation** of **nuclear isomers**

AU Booth, Edward C.

CS Boston Univ., Boston, MA, USA

SO U.S. Clearinghouse Fed. Sci. Tech. Inform., AD (**1969**), AD-697153, 7 pp. Avail.: CFSTI
From: U. S. Govt. Res. Develop. Rep. 1970, 70(2), 167
CODEN: XCCIAV

DT Report

LA English

CC 75 (Nuclear Phenomena)

AB Isomeric states of stable nuclei have been **excited** by photons and e via **short-lived** higher states. The isomer **excitation** expts. were undertaken in order to determine the relation between the total inelastic e scattering cross section and the radiative width, and to use the **isomer excitation function to** d**etermine the energies widths, and angular momenta of accessible states.** The following isotopes were studied: 87Sr, 103Rh, 111Cd, 113In, 115In, 117Sn, 135Ba, 137Ba, 195Pt, and 199Hg.

IT **Gamma** rays
(bombardment by, nuclear isomeric **excitation** in)

IT Nuclear energy levels
(**excitation** of, by electrons and **gamma** rays)

IT **13981-59-4**, properties **14191-71-0**, properties
14191-88-9, properties **14336-64-2**, properties
RL: PRP (Properties)
(nuclear energy levels of, **excited** by electrons and **gamma** rays)

RN 13981-59-4 HCAPLUS

CN Tin, isotope of mass 117 (CA INDEX NAME)

^{117}Sn

RN 14191-71-0 HCAPLUS

CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

RN 14191-88-9 HCAPLUS

CN Platinum, isotope of mass 195 (CA INDEX NAME)

^{195}Pt

RN 14336-64-2 HCAPLUS

CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

L128 ANSWER 35 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1970:17446 HCAPLUS

DN 72:17446

OREF 72:3187a,3190a

TI Nuclear photoactivation of selenium-77, silver-107, silver-109, cadmium-111, indium-115, and mercury-199

AU Boivin, Michel; Cauchois, Yvette; Heno, Yvonne

CS Lab. Chim. Phys., Fac. Sci. Paris, Paris, Fr.

SO Nuclear Physics A (**1969**), 137(3), 520-30
CODEN: NUPABL; ISSN: 0375-9474

DT Journal

LA English

CC 75 (Nuclear Phenomena)

AB The photoactivation of various isotopes is studied by using the **x -ray** bremsstrahlung produced by a 2-MeV e accelerator. The photoactivation cross section was calculated for each of the **observed nuclear levels.** Some of these levels were observed for the 1st time. Their probable characteristics are proposed or confirmed. In certain cases it was possible to determine partial widths and the **mean life of the level.**

IT **X-rays**
(bombardment by, of selenium-77 and silver isotopes)

IT **14191-71-0**, properties **14336-64-2**, properties
RL: PRP (Properties)
(nuclear energy levels of, from **x-ray** bombardment)

RN 14191-71-0 HCAPLUS

CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

RN 14336-64-2 HCAPLUS

CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

L128 ANSWER 36 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1969:466270 HCAPLUS
DN 71:66270
OREF 71:12237a,12240a
TI **Photoactivation with a cobalt-60 source**
AU Law, J.; Iddings, F. A.
CS Longwood Coll., Farmville, VA, USA
SO Journal of Radioanalytical Chemistry (**1969**), 3(1-2), 53-63
CODEN: JRACBN; ISSN: 0022-4081
DT Journal
LA English
CC 75 (Nuclear Phenomena)
AB Photoactivation of 13 elements was studied by using 5000-Ci. and 30,000-Ci. sources. Reported data from the study are presented in tables including exptl. conditions, observed activity, sensitivity achieved, . **gamma**. energies, and **half**-**life** observed, and reaction cross sections. Comparisons are made between this research and earlier reports.
IT **14191-71-0**, analysis **14336-64-2**, analysis
RL: ANT (Analyte); ANST (Analytical study)
(detection of, by **gamma**-ray activation)
RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

RN 14336-64-2 HCAPLUS
CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

L128 ANSWER 37 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1967:459835 HCAPLUS

DN 67:59835

OREF 67:11238e

TI **Excitation** of metastable levels in nuclei by photoactivation on indium-gallium radiation loop

AU Abrams, I.; Pelekis, L.; Taure, I.

SO Neitronoakt. Anal. (**1966**), 135-40
CODEN: 16GJAI

DT Conference

LA Russian

CC 75 (Nuclear Phenomena)

AB The isomers were obtained in an emitter of a radiation loop sphere-shaped and 15 cm. in diameter with a channel passing through it, 5 cm. in diameter An eutectic alloy (Sn 13, In 15, Ga 62%) was used as a circulating substance. The flux of γ-quanta in the middle of the sphere was 4 + 1012 γ-quanta/cm.2-sec. The following data were obtained: Isomer 111Cdm: T1/2 = 47 ± 1 min., Eγ = 152 ± 4 and 246 ± 4 kev., cross section (6.9 ± 1.4) + 10-6 mb.; 115Inm: T1/2 = 4.23 ± 0.08 hr., Eγ = 335 ± 4 kev., cross section (1.5 ± 0.3) + 10-4 mb.

IT **Gamma** rays
(facilities, of gallium-indium alloy loop, **excitation** of metastable levels in)

IT Nuclear energy levels
(metastable, photoactivation in gallium-indium alloy radiation loop)

IT **14191-71-0**, properties **14336-64-2**, properties
RL: PRP (Properties)
(**gamma**-rays from and **half-life** of metastable)

RN 14191-71-0 HCAPLUS

CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

RN 14336-64-2 HCAPLUS

CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

L128 ANSWER 38 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1964:408987 HCAPLUS
DN 61:8987
OREF 61:1436e-g
TI **Production of nuclear isomers. I. Production of nuclear isomers with bremsstrahlung**
AU Kaminishi, T.; Kojima, C.
SO Nagoya Kogyo Gijutsu Shikensho Hokoku (**1962**), 11(5), 284-95
From: Phys. Abstr. 65(778), Abstr. No. 18271(1962).
CODEN: NKGSAR; ISSN: 0027-7614
DT Journal
LA Unavailable
CC 12 (Nuclear Phenomena)
AB A number of stable elements were irradiated with bremsstrahlung from a 6-m.e.v. linear e accelerator to produce directly each nuclear isomer which has been confirmed by other nuclear reactions. After irradiation the sample was moved to the counting system to measure the radioactivity produced and the isomeric nuclide was determined from the half-**life** and γ-ray energy of its decay. The production of the following isomers was confirmed: 77Sem, 79Brm, 87Srm, 89Ym, 103Rhm, 107Agm + 109Agm, **111Cdm**, **113Inm + 115Inm**, **117Snm**, 135Bam + 137Bam, 167Erm, **179Hfm**, 183Wm, 191Irm, **195Ptm**, 197Aum, and 199Hgm. Radioactive substances with **halflives** of 150 sec. in the V sample and 2.0 sec. in the W sample were produced, but not every radioactive nuclide could be determined because no information was available. Not all isomers of even-even nuclei were observed, although some **half-lives** and . **gamma**.-ray energies could be easily measured by this method if these isomers were produced.
IT **Gamma** rays
(nuclear isomer production by)
IT **14191-88-9P**, Platinum, isotope of mass 195 **14265-76-0P**, Hafnium, isotope of mass 179
RL: PREP (Preparation)
(formation of metastable, by bremsstrahlung irradiation)
RN 14191-88-9 HCAPLUS
CN Platinum, isotope of mass 195 (CA INDEX NAME)

^{195}Pt

RN 14265-76-0 HCAPLUS
CN Hafnium, isotope of mass 179 (CA INDEX NAME)

^{179}Hf

IT **14191-71-0P**, Indium, isotope of mass 115
RL: PREP (Preparation)
(formation of metastable, by bremsstrahlung radiation)
RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

IT **13981-59-4P**, Tin, isotope of mass 117
RL: PREP (Preparation)
(production of metastable, by bremsstrahlung)
RN 13981-59-4 HCAPLUS
CN Tin, isotope of mass 117 (CA INDEX NAME)

^{117}Sn

L128 ANSWER 39 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1953:54226 HCAPLUS
DN 47:54226
OREF 47:9170f-g
TI Angular correlation of nickel60
AU Wiedling, T.
CS Univ. Stockholm
SO Arkiv foer Fysik (**1953**), 7, 69-71
CODEN: AFYSA7; ISSN: 0365-2440
DT Journal
LA English
CC 3A (Nuclear Phenomena)
AB A Co60 source in the form of CoCl2 gave an anisotropy, (W(π)/W(π/2)] - 1, of 0.147 ± 0.007.
IT Atomic nuclei
(deuteron-bombarded Zn)
IT Gamma rays
(from cadmium-111, angular correlations of)
IT **10198-40-0**, Cobalt, isotope of mass 60
(angular correlation of radiation from)
RN 10198-40-0 HCAPLUS
CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

IT **14336-64-2**, Cadmium, isotope of mass 111
(angular correlation of **γ-γ-cascade** from)
RN 14336-64-2 HCAPLUS
CN Cadmium, isotope of mass 111 (CA INDEX NAME)

^{111}Cd

L128 ANSWER 41 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1950:55568 HCAPLUS

DN 44:55568

OREF 44:10539a-c

TI **Radioactivity from enriched isotopes of cadmium**

AU Cork, J. M.; Rutledge, W. C.; Stoddard, A. E.; Branyan, C. E.; LeBlanc, J. M.

CS Univ. of Michigan, Ann Arbor

SO Physical Review (**1950**), 79, 938-9
CODEN: PHRVAO; ISSN: 0031-899X

DT Journal

LA Unavailable

CC 3A (Nuclear Phenomena)

AB By irradiating in the pile specimens of **Cd enriched in Cd108 and in Cd114**, it is possible to interpret more positively the observed radioactivities and to evaluate the γ-rays associated with each. Cd109 produced by neutron capture in Cd108 decays with a half **life** of .apprx.250 days by K-capture to Ag109, in which a strong **.gamma** .-ray of 87.5 e.kv. is emitted. Cd115 is isomeric with **half lives** of 54 hrs. and 42.6 days, both isomers decaying to In115 by β-emission. The 54-hr. activity yields γ-rays of energies 335.5, 343.7, 348.9, 369.3, 423.7, 451.9, 525.4, 559.1, and 713.1 e.kv. These γ-energies fit well a proposed nuclear level scheme in **In115.**

IT **Gamma** rays
(from cadmium isotopes)

IT Atomic nuclei
(isomerism of Sn)

IT **14191-71-0**, Indium, isotope of mass 115
(from decay of Cd115)

RN 14191-71-0 HCAPLUS

CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

IT **13981-59-4**, Tin, isotope of mass 117 **14314-35-3**, Tin, isotope of mass 119
(isomeric)

RN 13981-59-4 HCAPLUS

CN Tin, isotope of mass 117 (CA INDEX NAME)

^{117}Sn

RN 14314-35-3 HCAPLUS

CN Tin, isotope of mass 119 (CA INDEX NAME)

^{119}Sn

L128 ANSWER 42 OF 42 HCAPLUS COPYRIGHT ACS on STN

AN 1950:9465 HCAPLUS
DN 44:9465
OREF 44:1814b-e
TI Coincidence arrangement for scintillation counter
AU Meyer, K. P.; Baldinger, E.; Hahn, B.; Huber, P.
CS Univ. Basel, Switz.
SO Helvetica Physica Acta (**1949**), 22, 420-4
CODEN: HPACAK; ISSN: 0018-0238
DT Journal
LA Unavailable
CC 3A (Nuclear Phenomena)
AB The apparatus consists of an anthracene crystal, two photomultiplier tubes, and a coincidence-mixing circuit containing Ge diodes. The background is reduced by a factor of 500 compared with that for a single photomultiplier counting at the rate of 10,000 per sec. The discrimination curve of the circuit gives a plateau so that the number of counts registered depends only on the source, crystal, and their relative positions and is independent of the photomultipliers and the amplification. In order to count coincident events, a second crystal and a third photomultplier tube are added to the circuit. With this arrangement and **a Co60 source** of 0.01 millicurie, measurements were made on the directional correlation of the two **;. gamma.-rays emitted in cascade.** If K' and K'' are the number of true coincidences per min., at 180° and 90°, resp., η = (K' - K'')/K'' = 15 ±2%. The background was 1 count per min., the space angle was 0.01, and the number of accidental and true coincidences per min. were 6 and 60, resp.
IT **Gamma** rays
(from cobalt-60)
IT **Gamma** rays
(from indium-115)
IT **14191-71-0**, Indium, isotope of mass 115
(β- and γ-rays from)
RN 14191-71-0 HCAPLUS
CN Indium, isotope of mass 115 (CA INDEX NAME)

^{115}In

IT **10198-40-0**, Cobalt, isotope of mass 60
(γ-rays from)
RN 10198-40-0 HCAPLUS
CN Cobalt, isotope of mass 60 (CA INDEX NAME)

^{60}Co

```
   CAS/STN  FILE 'REGISTRY' ENTERED AT 13:29:44 ON 04 DEC 2009
L1          137 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  ?93NB?/CNS
L2           36 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  ?111CD?/CNS
L3           27 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  ?113CD?/CNS
L4            6 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  ?135CS?/CNS
L5           62 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  ?115IN?/CNS
L6           97 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  ?117SN?/CNS
L7           88 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  ?119SN?/CNS
L8          106 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  ?125TE?/CNS
L9           98 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  ?129XE?/CNS
L10          61 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  ?131XE?/CNS
L11          12 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  ?178HF?/CNS
L12           9 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  ?179HF?/CNS
L13          14 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  ?193IR?/CNS
L14          89 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  ?195PT?/CNS

     FILE 'STNGUIDE' ENTERED AT 13:30:02 ON 04 DEC 2009

     FILE 'REGISTRY' ENTERED AT 13:32:12 ON 04 DEC 2009
L15         835 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  (L1 OR L2 OR L3 OR
                L4 OR L5 OR L6 OR L7 OR L8 OR L9 OR L10 OR L11 OR L12 OR L13 OR L14)
L16         773 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  (L1 OR L2 OR L3 OR
                L4) OR (L6 OR L7 OR L8 OR L9 OR L10 OR L11 OR L12 OR L13 OR L14)
L17          62 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  ?115IN?/CNS

     FILE 'STNGUIDE' ENTERED AT 13:32:13 ON 04 DEC 2009

     FILE 'HCAPLUS' ENTERED AT 13:34:27 ON 04 DEC 2009
L18         625 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L4
L19          95 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L1
L20        1298 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L2
L21         982 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L3
L22        1817 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L5
L23         930 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L6
L24        2387 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L7
L25        1198 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L8
L26        2129 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L9
L27        1193 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L10
L28         752 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L11
L29         467 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L12
L30         524 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L13
L31        1296 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L14

     FILE 'REGISTRY' ENTERED AT 13:34:56 ON 04 DEC 2009
L32          62 SEA FILE=REGISTRY SPE=ON  ABB=ON  PLU=ON  60CO?/CNS

     FILE 'HCAPLUS' ENTERED AT 13:34:57 ON 04 DEC 2009
L33       10405 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L32

     FILE 'LCA' ENTERED AT 13:35:41 ON 04 DEC 2009

     FILE 'HCAPLUS' ENTERED AT 13:36:18 ON 04 DEC 2009
L34           1 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  US20080078961/PN
L35             SEL PLU=ON  L34 1- RN :       14 TERMS
L36         193 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L35
L37           1 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L34 AND L36

     FILE 'STNGUIDE' ENTERED AT 13:36:36 ON 04 DEC 2009

     FILE 'LCA' ENTERED AT 13:37:20 ON 04 DEC 2009
L38        1992 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  GAMMA
L39          96 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  CASCAD?
L40           0 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  RADIOCASCAD?
L41         677 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  DECAY?
L42           6 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  HALFLI?
L43         230 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  HALF LIFE
L44          57 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  HALF LIVES
L45         200 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  (LIFE OR LIVE##)(2A)(SHORT####### OR LONG###### OR
LENGTH######)
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CAS/STN (CONTINUED)

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     FILE 'LCA' (CONTINUED)
L46            0 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  LONGLIF?
L47            1 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  LONGLIV?
L48            0 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  SHORTLIV?
L49            0 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  SHORTLIF?
L50           27 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  DEEXCIT? OR DE EXCIT?
L51         1573 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  EXCIT?
L52          160 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  (MIX##### OR BLEND##### OR PAIR##### OR DOUBLE OR
TWO OR SECOND OR 2ND OR COUPL#### OR ANOTHER)(3A)(?ISOMER? OR ?NUCLIDE? OR NUCLEIDE? OR ?SPECIES?)
L53           47 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  (MIX##### OR BLEND#####
                OR PAIR##### OR DOUBLE OR TWO OR SECOND OR 2ND OR COUPL#### OR ANOTHER)(3A)?ISOTOP?
L54           24 SEA FILE=LCA SPE=ON  ABB=ON  PLU=ON  ENTANGL######

     FILE 'HCAPLUS' ENTERED AT 13:42:46 ON 04 DEC 2009
L55           73 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L22 AND L33
L56          115 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  (L18 OR L19 OR L20 OR L21) AND L33
L57          153 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  (L23 OR L24 OR L25 OR L26 OR L27 OR L28 OR L29
OR L30 OR L31) AND L33
L58          236 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  (L23 OR L24 OR L25 OR
                L26 OR L27 OR L28 OR L29 OR L30 OR L31) AND L22
L59          230 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  (L18 OR L19 OR L20 OR L21) AND L22

     FILE 'STNGUIDE' ENTERED AT 13:42:48 ON 04 DEC 2009

     FILE 'HCAPLUS' ENTERED AT 13:45:05 ON 04 DEC 2009
L60          142 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  (L58 OR L59) AND
                (GAMMA OR X(2A)(RAY OR RADIATION OR PHOTON######))
L61           73 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L22 AND L33
L62          170 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  (L56 OR L57) NOT L55
L63          368 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  (L60 OR L61 OR L62)
L64          197 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L38
L65            9 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L39
L66            0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L40
L67           65 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L41
L68            2 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L42
L69           20 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L43
L70           13 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L44
L71           31 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L45
L72            0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L46
L73            0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L47
L74            0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L48
L75            0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L49
L76            1 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L50
L77           59 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L51
L78            6 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L52
L79            3 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L53
L80            1 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L54
L81              SEL PLU=ON  L34 1- IPC ECLA FTERM NCL :       5 TERMS
L82         6074 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L81
L83            1 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND L82

     FILE 'STNGUIDE' ENTERED AT 13:48:04 ON 04 DEC 2009

     FILE 'HCAPLUS' ENTERED AT 13:50:07 ON 04 DEC 2009
L84           19 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L63 AND X(2A)(RAY OR
                RADIATION OR PHOTON######)
L85           45 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L64 AND L67
L86           53 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L64 AND L77
L87           17 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L67 AND L77

     FILE 'LCA' ENTERED AT 13:50:49 ON 04 DEC 2009

     FILE 'HCAPLUS' ENTERED AT 13:52:25 ON 04 DEC 2009
L88          135 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L65 OR (L68 OR L69 OR
                L70 OR L71 OR L72 OR L73 OR L74 OR L75 OR L76) OR (L78 OR L79
                OR L80) OR L83 OR (L84 OR L85 OR L86 OR L87)
L89          135 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L88 NOT L34
L90           53 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L89 AND 1940-1980/PY
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CAS/STN (CONTINUED)

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     FILE 'HCAPLUS' (CONTINUED)
L91          74 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L89 AND 1981-2005/PY
L92           0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L89 AND 1981-2004/PRY
L93           0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L89 AND 2005/PRY AND (WO OR US)/PRC
L94         127 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L90 OR L91
L95           0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L94 AND ENTANGL########(6A)GAMMA
L96         480 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  ENTANGL######## AND GAMMA
L97           0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L94 AND L96
L98           0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L94 AND ENTANGL?
L99           3 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L94 AND (MIX##### OR BLEND##### OR PAIR##### OR
DOUBLE OR TWO OR SECOND OR 2ND OR COUPL#### OR ANOTHER)(3A)?ISOTOP?
L100          6 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L94 AND (MIX##### OR BLEND##### OR PAIR##### OR
DOUBLE OR TWO OR SECOND OR 2ND OR COUPL#### OR ANOTHER)(3A)(?ISOMER? OR ?NUCLIDE? OR NUCLEIDE? OR
?SPECIES?)
L101         41 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L94 AND L5(L)GAMMA
L102          0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L94 AND L5(L)CASCAD?
L103          7 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L5(L)CASCAD?
L104          0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L94 AND L5(L)?CO60?
L105          2 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L94 AND L5(L)?60CO?
L106          0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L94 AND L5(L)CO
L107          0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L94 AND L5(L)COBALT
L108          4 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L5(L)COBALT
L109          5 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L5(L)CO
L110         73 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L22 AND L33
L111         30 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L110 AND GAMMA

     FILE 'LCA' ENTERED AT 13:58:08 ON 04 DEC 2009

     FILE 'HCAPLUS' ENTERED AT 13:59:44 ON 04 DEC 2009
L112        121 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L65 OR L68 OR L70 OR
                L76 OR (L78 OR L79 OR L80) OR L84 OR L87 OR (L99 OR L100 OR
                L101 OR L102 OR L103 OR L104 OR L105 OR L106 OR L107 OR L108 OR L109) OR L111
L113          1 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L94 AND L36
L114          1 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L113 NOT L34
L115        122 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  (L112 OR L113 OR L114) NOT L34
L116         64 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L115 AND 1980-2005/PY
L117         50 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L115 AND 1940-1979/PY
L118        114 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  (L116 OR L117)
L119          1 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L118 AND DEEXCIT?
L120          0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L118 AND DE EXCIT?
L121         10 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L118 AND EXCIT#######(2A)STATE
L122         20 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L118 AND LIFE
L123         20 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L118 AND LIVE##
L124          2 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L118 AND HALFLI?
L125          0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L118 AND SHORTLI?
L126          0 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L118 AND LONGLI?
L127          6 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L118 AND (GAMMA OR X)(5A)CASCAD?
L128         42 SEA FILE=HCAPLUS SPE=ON  ABB=ON  PLU=ON  L114 OR (L119 OR L120
                OR L121 OR L122 OR L123 OR L124 OR L125 OR L126 OR L127)
                D ALL HITSTR TOT
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EAST Search History for a search on 12-4-2009:

L3	PrArt	57	"5674177" or ru adj "2064697"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/12/04
L4	PrArt	24	L3 and (gamma or (x adj (ray or radiation))) with (second or two or composition or composite or mix$8 or blend$8 or isomer$5 or radioisomer$5 or nuclide or nucleide or radionucl$8 or species or isotop$8 or radioisotop$8)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/12/04
L5	PrArt	26	L3 and (level or entangl$7 or energy or excit$7 or deexcit$7) with (second or two or composition or composite or mix$8 or blend$8 or isomer$5 or radioisomer$5 or nuclide or nucleide or radionucl$8 or species or isotop$8 or ...	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/12/04
L6	PrArt	42	L3 and (level or entangl$7 or energy or excit$7 or deexcit$7 or second or two or composition or composite or mix$8 or blend$8 or isomer$5 or radioisomer$5 or nuclide or nucleide or radionucl$8 or species or isotop$8 or radi...	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/12/04
L7	PrArt	20	L4 and L5 and L6	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/12/04
L8	PrArt	2	"5674177" or ru adj "2064697"	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/12/04
L10	PrArt	12	L7 and (hastings or brick)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/12/04
L12	PrArt	21	L3 and (level or entangl$7 or energy or excit$7 or deexcit$7 or second or two or composition or composite or mix$8 or blend$8 or isomer$5 or radioisomer$5 or nuclide or nucleide or radionucl$8 or species or isotop$8 or radi...	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/12/04
L13	PrArt	21	L12 and (L4 or L5 or L6)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/12/04

EAST Search 11-30-09:

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	0	"2008315210"	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 08:08
L2	1	"20080315210"	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 08:08
L3	1	"20080078961"	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 08:29
L4	1	2005-716517.NRAN.	DERWENT	OR	OFF	2009/11/30 08:33
L7	0	(mix$6 or blend$5) near5 two adj1 (isotopes or radioisotopes or isomers or radioisomers) and (half adj lif$2 or half adj liv$2)	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:37
L8	0	(mix$6 or blend$5) near5 two adj1 (isotopes or radioisotopes or isomers or radioisomers) and decay$5	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:41
L9	21	(mix$6 or blend$5) near5 (isotopes or radioisotopes or isomers or radioisomers) and decay$5	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:41
L10	0	(mix$6 or blend$5) near5 (isotopes or radioisotopes or isomers or radioisomers) and halflif$4	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:41
L11	0	(mix$6 or blend$5) near5 (isotopes or radioisotopes or isomers or radioisomers) and halfliv$4	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:41
L12	4	(mix$6 or blend$5) near5 (isotopes or radioisotopes or isomers or radioisomers) and half adj liv$4	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:42
L13	22	(mix$6 or blend$5) near5 (isotopes or radioisotopes or isomers or radioisomers) and half adj lif$4	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:42
L14	42	L9 L12 L13	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:42
L15	1	L14 and shift$6	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:43
L16	1	L14 and curv$5	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:43

EAST Search History (Prior Art)

L17	2	L14 and g21k$	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:44
L18	3	L14 and k09-e$	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:44
L19	5	L17 L18	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:44
L20	29639	g21k$	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:50
L21	4010	k09-e$	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:51
L22	33573	L20 L21	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:51
L23	3	L22 and decay$5 near5 shorter	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:51
L24	12	L22 and decay$5 near5 short$8	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:51
L25	7	L22 and decay$5 near5 long$5	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:51
L26	0	L22 and decay$5 near5 length$5	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:51
L27	1	L22 and decay$5 near5 curv$6	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:52
L28	19	L23 L24 L25 L27	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 09:52
L29	5	L28 and gamma	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:22
L30	152	gamma near7 decay$7	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:24
L31	0	L30 and (mix$6 or blend$6) near4 two	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:25

EAST Search History (Prior Art)

L32	1	L30 and (mix$6 or blend$6 or two or second) near2 (isomer$5 or radioisomer$5 or radioisotop$6 or isotop$6 or nuclid$5 or nucleid$6 or radio or radionucl$9)	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:26
L33	0	L30 and composite near3 half	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:27
L34	18	L30 and lives	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:28
L35	18	L30 and lifes	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:28
L36	14	L30 and half	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:28
L37	19	L34 L35 L36	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:28
L38	0	L37 and composite	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:29
L39	0	L37 and mix$5	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:29
L40	0	L37 and blend$5	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:29
L41	6	L37 and two	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:29
L42	4	L37 and second	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:29
L43	10	L41 L42	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:29
L44	1178	(vary$6 or vari$5 or chang$6 or increas$5 or decreas$6) near6 half adj life	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:32
L45	31	(vary$6 or vari$5 or chang$6 or increas$5 or decreas$6) near6 half adj life near6 (composite or blend$6 or mix$6 or effective)	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:32

EAST Search History (Prior Art)

L46	31	(vary$6 or vari$5 or chang$6 or increas$5 or decreas$6) near6 half adj lives near6 (composite or blend$6 or mix$6 or effective)	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:32
L47	0	(vary$6 or vari$5 or chang$6 or increas$5 or decreas$6) near6 halflives near6 (composite or blend$6 or mix$6 or effective)	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:33
L48	0	(vary$6 or vari$5 or chang$6 or increas$5 or decreas$6) near6 halflife near6 (composite or blend$6 or mix$6 or effective)	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:33
L49	31	L45 L46	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:33
L50	0	L49 and decay$5 near4 curv$5	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:33
L51	0	L49 and decay$5	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:33
L52	0	L49 and curv$5	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:33
L53	0	L49 and gamma	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:34
L54	0	L49 and skew$6 near6 effective adj half adj life	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:34
L55	0	skew$6 near6 effective adj half adj life	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:34
L56	2	graph$5 near6 effective adj half adj life	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:34
L57	0	curv$6 near6 effective adj half adj life	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:34
L58	0	skew$6 near6 effective adj half adj life	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:35

EAST Search History (Prior Art)

L59	1	curv$5 near6 effective adj half adj life	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:35
L60	4	graph$6 near6 effective adj half adj life	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:36
L61	0	fig near6 effective adj half adj life	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:36
L62	0	figure near6 effective adj half adj life	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:36
L63	5	L56 L59 L60	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:36
L64	6862	(long$6 near7 short$5) near7 (life or lived or live or halflife or halflive$1)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:44
L65	10	(long$6 near7 short$5) near7 (life or lived or live or halflife or halflive$1) near7 (isptop$5 or radioisotop$6 or nuclide or radionu$8 or nucleide or isomer$6 or radioisomer$6) near7 (two or second)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:46
L67	0	hybrid near4 radiation near4 source near12 (decay$6 or long$5 or short$6 or half or halfli$6) near12 gamma	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:54
L68	0	hybrid near4 (radiation or source) near12 (decay$6 or long$5 or short$6 or half or halfli$6) near12 gamma	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:55

EAST Search History (Prior Art)

L69	47	hybrid near4 radiation near4 source	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:55
L70	0	L69 and g21k$6	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:57
L71	2	(nix$7 or blend$6) near4 halflife	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:57
L72	36	(nix$7 or blend$6) near4 half adj life	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:57
L73	36	L71 L72	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 10:58
L74	10	L64 and g21k$	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 11:00
L75	56	"5674177"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 11:06
L76	25	L75 and (long$5 or short$6) near5 (life or lives or halfli$6 or lived or decay$6)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 11:07

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L77	10	L75 and (relat$4 or relation$7 or relativ$5 or compar$4 or comparat$6) near5 (life or lives or halfli$6 or lived or decay$6)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 11:09
L78	10	L76 and L77	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 11:09
L79	1008	(curv$5 or graph$5 or fig or figure) near4 (half adj life)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 11:12
L80	0	(curv$5 or graph$5 or fig or figure) near7 ((half adj life) or halfli$7) near7 (hybrid or composite or mix$3 or mixture or blend$5 or two) near7 (radio or radioactiv$6 or radioisotop$6 or nuclide or nucleide or radionu$7 or radioisomer$6 or isomer$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 11:15
L81	89	(curv$5 or graph$5 or fig or figure) same ((half adj life) or halfli$7) same (hybrid or composite or mix$3 or mixture or blend$5 or two) near7 (radio or radioactiv$6 or radioisotop$6 or nuclide or nucleide or radionu$7 or radioisomer$6 or isomer$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 11:16
L82	20	L81 and shorter	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 11:16
L83	32	L81 and longer	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 11:17

EAST Search History (Prior Art)

L86	43	L81 and gamma neAR5 (EMIT$6 OR EMISS$5 or decay$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 11:18
L87	8	L81 and L82 and L83 and L84	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 11:19
L88	0	"3017514" and halflives	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/11/30 11:21
L89	0	"3017514" and halflifes	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/11/30 11:21
L90	0	"3017514" and half adj lifes	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/11/30 11:21
L91	1	"3017514" and half adj lives	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/11/30 11:21
L92	3	"3017514" and (composite or mix$3 or mixture or blend$6 or composition or compos$4 or compris$6) near3 two	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/11/30 11:23

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- ☐ Results verified the lack of relevant prior art (helped determine patentability).

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